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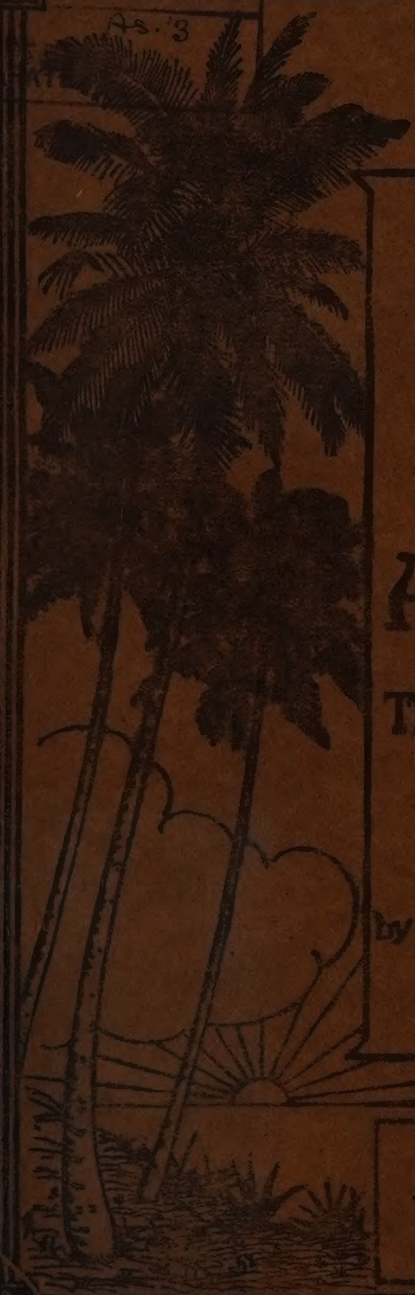

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EDITORIAL

UNIFORM NATURAL RUBBER

AN article in this number draws attention to certain aspects of natural rubber production as compared to the synthetic products. The present system of grading natural rubber on appearance has long been recognised as rather remote from its processing characteristics and intrinsic value in many manufactured products. The minute attention paid by graders to small defects, or so-called defects are often regarded by producers as merely a device to cut prices. Not that they do not recognise that grading was necessary, but there is a general feeling that the characters on which it has been and is still based were themselves uncorrelated to real value. The appearance of standard quality synthetics whose processing behaviour could be accurately stated and held constant over large batches has introduced a product having a feature valuable to manufacturers which has hitherto been lacking in natural rubber. The variability of natural rubber has become recognised as a serious disadvantage now that uniform synthetics are easily available. It is not a question so much of the merits or demerits of the best natural compared to synthetics as to the inability of manufacturers to depend on any consignment of natural to repeat the manufacturing behaviour of another consignment having the same grade based on appearance. It is this variability which has come to be recognised as one of the most serious disadvantages of natural.

The French and Dutch producers in Indo-China and the Netherlands East Indies have already realised this feature of the natural product and have taken active steps to overcome it. They have recognised that to meet the menace of synthetics it will be necessary to apply all the technical resources available to produce a high-grade and uniform product. In order to do this they have accepted the idea that centralised factories, or at least very large factories, are necessary so that latex can be bulked and each batch tested for its physical manufacturing qualities and marketed with a guaranteed standard of performance. While the bulking of latex is obviously the best

method of producing large batches of standard quality, since each can be tested for its physical and chemical characters, the grading of crepe and smoked sheet on a performance basis and less on conventional appearance may have possibilities.

The French and Dutch authorities have agreed to using standard marking for bales having agreed characteristics and the methods of determining these have been tentatively accepted. There are now coming onto the markets parcels of natural rubber which can be bought on a performance basis and not merely on appearance, so that a manufacturer interested in using a particular grade can obtain it with surity and reduce losses from rejects which inevitably occur when purchases have to be made on appearance.

It will be easily apparent that with standardised natural rubber becoming available from two of the largest producers and with Malaya taking a very active interest and likely to follow suit soon, a new menace to Ceylon rubber has arisen. In the near future it will have to contend not only against synthetics but also against uniform natural rubber.

The Far Eastern producers have certain advantages over Ceylon, particularly as regards the topography of their large estates and their higher acreage of high-yielding clones. The centralising of manufacture will there be easier than will be the case in Ceylon, where many small and relatively inefficient properties giving low yields abound. The problem of reducing production costs in Ceylon, quite apart from any standardisation, has already been realised and some form of amalgamation, including factory concentration, is under active consideration. If this can be combined with the production of uniform grades marketed under guaranteed marks it may be possible for the better properties in Ceylon to compete with the uniform products of other producers. The amount of progress in producing uniform rubber may be gauged by an interesting publication of the Syndicat des Planteurs of Saigon, "Communication aux Planteurs No. 3" issued early in 1949, which gives detailed instructions for the production of standard grades. These grades are specified in another publication of the Institut des reserches sur le caoutchouc en Indochine entitled "Les caouchouc spécifiés". In Malaya, Indochina and the N. E. I. special bodies have been set up to consider ways and means of establishing the manufacture of uniform, tested grades and, with the advantages these countries possess, there can be no doubt that specified products will soon be appearing on the markets in considerable quantities. The unspecified product of unknown viscosity and curing behaviour will then meet a new and very dangerous competitor.

A New Citrus Variety–The Seedless Bibile Sweet Orange

A. V. RICHARDS, M.Sc. (Calif.), B.Sc. (Lond.), Dip. Agric. (Cantab.), A.I.C.T.A. (Trinidad),
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SUMMARY

MOST of the well known commercial citrus varieties such as the Marsh Seedless grapefruit, Washington Navel orange, Shamouti orange, Seedless Tahiti lime, Japanese Satsuma mandarin, &c., which have relatively few or no seeds, have originated as chance seedlings or bud sports of seedy types. The seedless Bibile sweet orange is a promising new citrus variety developed recently in Ceylon. It appears to have arisen as a nucellar seedling variant of the Bibile sweet orange, which is very seedy. Budgrafts of this variety produce fruits which are almost seedless and superior in flavour and quality to the seedling orange.

INTRODUCTION

Commercial varieties of citrus fruits which contain relatively few seeds generally command a premium in the world markets. But the preference is for citrus fruits of desirable varieties which are entirely seedless since it is easy to extract their juice, or prepare them for use at table as fresh or processed fruit. They can be left long on the tree to tide over periods of glut without danger of spoilage through germination of the seeds inside. The paucity of seeds also helps to reduce the drain of nutrient elements from the soil by the fruit crop.

SEEDLESS CITRUS VARIETIES

The most famous seedless citrus variety is the Washington Navel orange of California which is believed to have originated as a bud sport of the Selecta orange grown near Bahia, Brazil. One of the two budded trees of this variety obtained from the United States Department of Agriculture at Washington and planted at Riverside, California, in 1873 by Mrs. Eliza Tibbets is still alive, and it is from this early introduction that the entire Navel orange industry of California and most of the world has developed. In 1920 a grateful community dedicated a monument to her memory in the Eliza Tibbets Memorial Park at Riverside, California. The monument bears the inscription "To honor Mrs. Eliza Tibbets, and to commend her work in planting at Riverside in 1873, the first Washington Navel orange tree in California. Native to Bahia, Brazil, proved the most valuable fruit introduction yet made by the United States Department of Agriculture—1920".

Other well known seedless citrus fruits which develop parthinocarpically are the Seedless Tahiti lime and the Japanese Satsuma mandarin. They are entirely seedless in solid plantings, but when grown with other citrus ruits in mixed orchards a seed or two may occasionally develop in the fruit. The Marsh grapefruit, Valencia and Shamouti oranges, and Eureka lemon contain relatively few seeds and are regarded as commercially seedless.

The Marsh grapefruit is believed to have originated from a seedling grapefruit tree, presumably of nucellar origin, on a farm near Lakeland, Florida (1). The Lue Gim Gong orange of Florida which produces nearly seedlesss fruits is also considered to be a nucellar variant from the seedling progeny of cross-pollinated Valencia (2).

Among the new seedless citrus varieties which are probably seedling variants of nucellar origin are the Davis grapefruit, a seedless type derived from a seedy parent which is better suited for canning than Marsh grapefruit owing to the firm texture of its pulp, and the Armstrong seedless lemon, sold by Armstrong nurseries, California, under United States Patent No. 342, which originated as an entire-tree budsport at Riverside, California (3).

LOCAL CITRUS VARIETIES

There is no record of the occurrence of budsports or nucellar seedling variants in local citrus varieties such as the Vavuniya and Bibile sweet oranges, local mandarin and lime which are generally grown from seed in village gardens. Being highly polyembyonic they invariably come true to type from seed although occasionally hybrid plants, mostly of undesirable type, are produced.

The Bibile sweet orange, which is a seedling variety, is grown extensively without irrigation in village gardens between Bibile, Maha Oya and Moneragala in the Province of Uva where soil and climatic conditions are very favourable for healthy growth of citrus. It makes an excellent squash orange as the fruits are juicy and somewhat more acid than the Vavuniya sweet orange which is essentially a dessert orange. But they are very seedy with an average of 10 to 12 seeds per fruit.

THE SEEDLESS BIBILE SWEET ORANGE

While judging fruit exhibits at an Agricultural Show held at Bibile in March, 1938, the writer came across a cluster of Bibile sweet oranges which contained fewer seeds in each fruit than the ordinary Bibile sweet orange. The parent tree which is still alive (Plate I), was located in a village garden at Etanawatte, near Bibile, with the assistance of the Agricultural Instructor. There are in the garden other seedling Bibile Sweet orange trees of about the same age bearing seedy fruits (Plate 2). Nothing definite is known about the history of the parent tree. It is about 25 to 30 years old and has in all probability originated as a nucellar seedling variant, for according to Frost (4) " it seems well established that occasional nucellar seedlings are genetically unlike their parents, and that valuable varieties have arisen in this way ".

(*Block by Survey Department.*)

Plate 1.—The parent tree of the seedless Bibile sweet orange in a village garden at Etanawatte, Bibile.

(*Block by Survey Department.*)

Plate 2.—A view of the village garden showing the parent tree of the seedless Bibile sweet orange in the foreground with other seedling Bibile orange trees.

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Plate 3.—One year old bud graft of the seedless Bibile sweet orange on rough lemon stock at the Citrus Station, Bibile.

Buds were selected from this tree by the writer on his return from study leave in California in 1940 and budded on the available rough lemon stocks in the nursery at the Citrus Station, Bibile. The budded progeny was planted out in a clonal plot on the station with other selected citrus clones for comparison (Plate 3).

The budded trees came into flower in about four years and set good crops (Plates 4 and 5). The fruits were found to contain fewer seeds than those of the seedling parent tree. Many fruits were entirely seedless (Plate 6) while a few had at the most only 2 to 3 seeds each though grown in a mixed orchard in close proximity to sweet orange, marmalade orange, grapefruit, mandarin, rough lemon and acid lime. But the flowers were found to have good pollen of bright yellow colour unlike those of the Washington Navel orange which is completely male sterile and does not produce viable pollen. The presence of own viable pollen does not apparently influence the production of seed to a marked degree in the Seedless Bibile variety. Pollination experiments are in progress to determine whether the clone is completely self sterile and whether the production of few seeds is due to the development of nucellar or gametic embryos through the stimulus of fertilization by own or foreign pollen. Solid plantings have also been made recently to see whether complete seedlessness would occur under such conditions (Plate 7).

The Seedless Bibile sweet orange matures a month or two later than the ordinary Bibile sweet orange which is in season in April–May. A second crop is often produced by the seedless budgrafts during the off season in November when oranges are generally scarce.

The fruits have a tendency to colour naturally on the trees, and when protected by paper bags against attack by the fruit piercing moths (*Othreis Sp.*) the colour becomes more intense and attractive. They are fairly thin-skinned, juicy and of excellent quality and flavour. The sugar-acid content of representative samples of fruit of budded seedless orange and seedling orange trees analysed by the Agricultural Chemist are given in table I.

TABLE I

	Seedless Bibile Sweet Orange	*Seedy Bibile Sweet Orange*
Av. weight of fruit	194·3 grms.	164·2 grms.
Av. volume of juice	86·5 cc.	64·4 cc.
Total Solids (Brix)	10·8	11·9
Citric acid	·92%	1·38%
Sugar/acid ratio	11·7	8·6

A fair comparison is not possible as the rough lemon stock is known to depress both the sugar and acid contents of fruits of most varieties of budded citrus in the early years (5). The fruits of the seedless budgrafts should therefore improve in flavour and quality as the trees age. The variety has been budded separately on other rootstocks such as the sweet orange, marmalade orange and sour lime in order to study its performance on different rootstocks in the various climatic zones of the Island. It has also been multiplied extensively on the rough lemon stock. Judging from its performance so far it bids fair to be one of the finest oranges grown in the tropics.

ACKNOWLEDGMENT

The writer's thanks are due to Dr. D. E. V. Koch, Agricultural Chemist for determining the sugar-acid content of the sweet orange samples, and to Mr. Sidney Silva, Agricultural Instructor, Bibile, for assistance in conducting the pollination and budgrafting trials. He is also grateful to Mr. A. I Wirasinghe of the Propaganda Division for taking the photographs.

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(*Block by Survey Department.*)

Plate 4.—Four year old seedless Bibile sweet orange tree on rough lemon stock in fruit at the Citrus Station, Bibile.

(*Block by Survey Department.*)

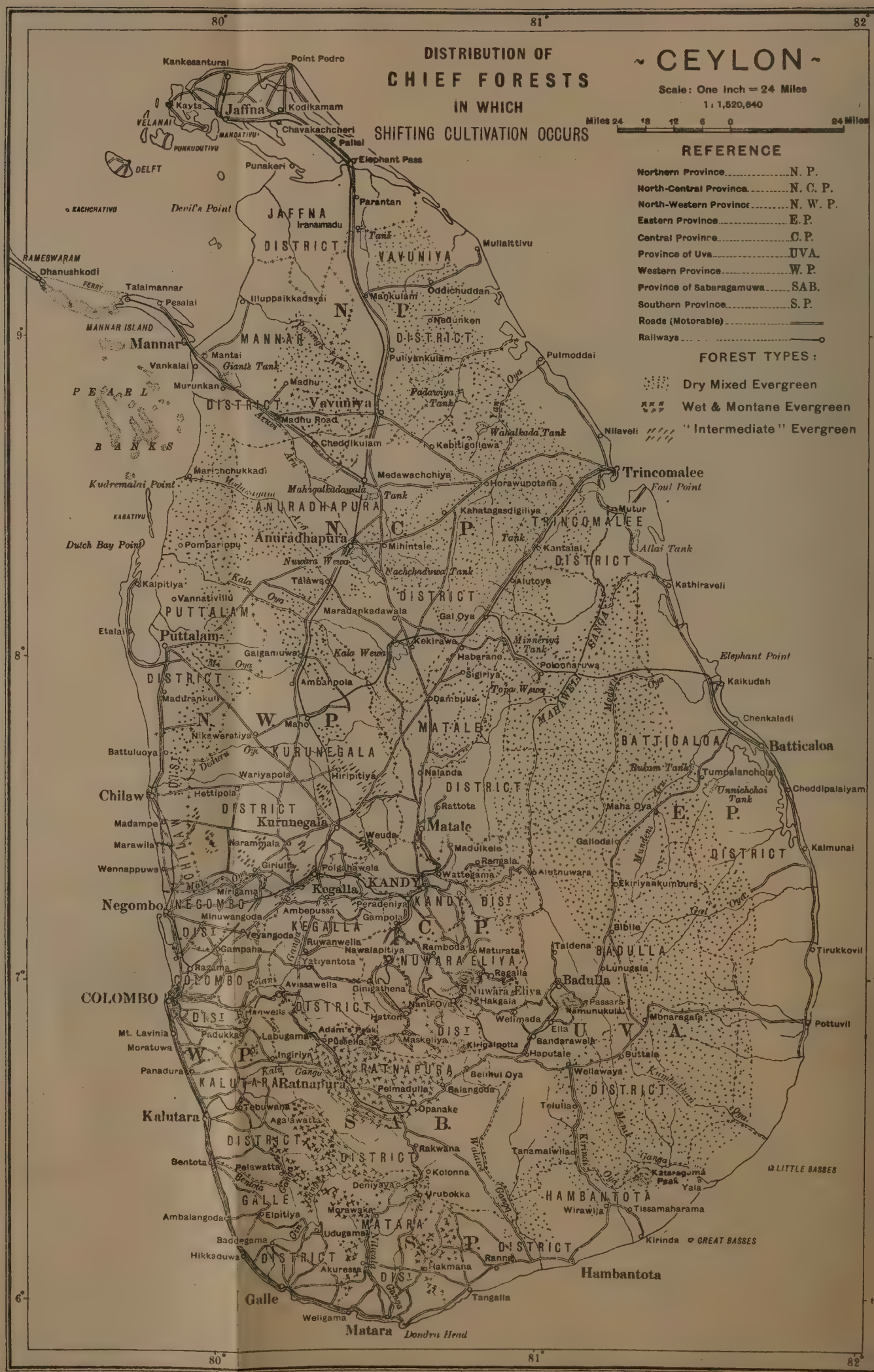
Plate 5.—A close-up of the seedless Bibile sweet orange tree in fruit at the Citrus Station, Bibile.

(*Block by Survey Department.*)

Plate 6.—Seedless Bibile sweet oranges from young budgrafts at the Citrus Station, Bibile.

(*Block by Survey Department.*)

Plate 7.—Solid planting of one year old budgrafts of seedless Bibile sweet orange on rough lemon stocks at the Citrus Station, Bibile.



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Some Aspects of Shifting Cultivation in Ceylon

BY

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ABSTRACT

THIS paper deals with Shifting (*Chena*) Cultivation in Ceylon mainly from the view-point of the forester. The practice of *chena* cultivation and its salient modifications in relation to the chief forest types, viz., dry mixed evergreen, wet evergreen and "intermediate" evergreen are described.

Plantations raised by the Forest Department by the "*Taungya*" (Co-operative) system have given successful results especially of teak in the dry evergreen forests and jak and mahogany in the intermediate forests. Suggestions are made for improvements in the future practice of *chena* cultivation.

Ecological changes brought about by *chena* cultivation are described and considered in the application of natural regeneration as a means for rehabilitating abandoned *chenas*. While this method is likely to be successful in some of the wet evergreen forests, it is ruled out for the dry mixed evergreen forests as natural regeneration is inadequate and its growth too slow.

Finally, the results of investigations carried out by Joachim in 1948 on soil fertility in relation to chena cultivation are examined. Further investigation, especially in the mixed dry evergreen forests, is necessary to determine the period of fallow for successful rotational cultivation.

GENERAL

Shifting cultivation in Ceylon, commonly known as "*Chena*" (adapted from the Sinhalese "*hena*") cultivation is probably a survival of a primitive form of agriculture prevalent in most countries in the Tropics, though not confined to the Equatorial Belt. In Ceylon, shifting cultivation is usually associated with the relatively flat tracts of dry mixed evergreen forests (i.e., the dry zone), where irrigation facilities for permanent agriculture are lacking. In this respect *chena* cultivation in its original form in Ceylon differs somewhat from the practice in other Asiatic countries, India, Burma, Malaya, Siam and Indonesia, in which it is prevalent mainly on the hills of the wet evergreen forests, where the slope of the land does not permit the use of animal-drawn implements. In Ceylon, *chena* cultivation also extends to the low foot hills of the central massif in the Matale District, generally below 2,000 feet altitude, but associated with the dry mixed evergreen forest type.

The accompanying map shows the distribution of shifting cultivation in Ceylon and is based on the figures of the Census of Agriculture taken in 1946. According to this Census, *chenas*, both "cultivated" and "uncultivated", the latter probably referring to recently abandoned *chena*, make up a total of approximately 230,000 acres representing less than 2 per cent. of the total land area of Ceylon. Of this 230,000 acres, roughly 160,000 fall in the dry mixed evergreen forest types and the balance, roughly 70,000 acres in the wet and montane evergreen forest types. It is almost certain that these statistics do not take into account, large tracts of forest, especially in the dry mixed evergreen forests, brought under *chena* cultivation within recent times and now consisting of degraded forest, scrub or grassland.

Chena cultivation in the wet and montane evergreen forests takes a somewhat modified form in that it is most often a purely transient phase to conversion into permanent peasant holdings, in which such agricultural crops as coconuts, tea, rubber and arecanuts, may be grown along with timber and fruit trees, such as jak (*Artocarpus integra Merr.*) and breadfruit.

FOREST TYPES IN RELATION TO CHENA CULTIVATION

Chena cultivation is chiefly carried out in forests under the ownership of the State, private ownership being limited to about 0·6 per cent. of the total area of forest (including savanna, scrub and grassland) which is estimated at roughly 17,000 square miles. The forest type felled is seldom virgin or pristine forest, but is usually a secondary forest type. In the dry mixed evergreen forests falling within a zone of less than 75 inches annual rainfall, the forest type felled varies from a high forest type to a degraded "low jungle" type. The former usually contains the valuable timber species, satin (*Chloroxylon swietenia* D. C.) and *palu* (*Manilkara hexandra* Dubard) in association chiefly with *wira* (*Hemicyclia sepiaria* W. & A.) and other understorey tree and shrub species. This type of forest is, ecologically, usually a seral or sub-climax stage. The degree of dominance and growth of satin and *palu* indicates the age of the secondary forest. Usually more ecologically advanced high forest types containing *ranai* (*Alseodaphne semecarpifolia* Nees), *halmilla* (*Berrya cordifolia* Burret) and ebony (*Diospyros ebenum* Koenig) are not felled for *chenas*. "Low jungle" comprises forest in an early seral stage in which *palu* and satin are less frequent. Other less valuable understorey species such as *wira*, *welang* (*Pterospermum canescens* Roxb.), *pannaka* (*Pleurostylia opposita* Alston), *mora* (*Nephelium longana* Camb.), *galseru* (*Premna tomentosa* Willd.), *seru* (*Syzygium sp.*), *deduwa* (*Eugenia bracteata* Roxb.), *kunumella* (*Diospyros ovalifolia* Wight), *malkera* (*Ochna squarrosa* L.) and shrubs form an inferior forest type in which the dominant height growth seldom exceeds 30 feet.

The wet evergreen forest type occurs chiefly in the west and south-west coastal plains and highlands roughly below 3,000 feet altitude with an annual average rainfall of over 100 inches of which over 40 inches fall in the south-west monsoon. The wet evergreen forest type is not normally associated with a regular *practice* of chena cultivation. The forest type is variable, and as in the case of the dry mixed evergreen forest, usually only secondary forest types are felled.

Milla (*Vitex pinnata* L.), *diyapara* (*Wormia triquetra* Rottb.), *hedawaka* (*Chaetocarpus castanocarpus* Thw.), *welipenna* (*Anisophyllea cinnamomoides* Gardn. and Champ.), *godapara* (*Dillenia retusa* Thunb.) and *pepaliya* (*Aporosa latifolia* Thw.) are the principal species occurring in the communities of secondary forest. Usually more ecologically advanced, i.e., climax type forests containing *Dipterocarpus*, *Doona* and *Mesua* species are seldom felled for *chena* cultivation.

Chena cultivation is also extensive in the "intermediate" wet evergreen forests, a borderline type between the wet and dry types proper occurring chiefly in the North-Western Province. In parts of the Central Province and Uva, montane evergreen forest, savanna, and grassland (*patana*) have also been recently brought under chena cultivation, but such cultivation is more of a sporadic nature.

FORMS OF CHENA CULTIVATION

The usual practice, in particular in the "dry" zone is the control of allocation of *chena* land by the Government Agent of the Province on permits issued by him. In areas under regular *chena* cultivation, particularly in parts of the North-Western Province where *chena* cultivation is the livelihood of peasant communities, land is set apart ("mapped out") for *chena* cultivation. The procedure in the past has been to allot land on some form of rotation, usually 10-15 years. Such a rotation is also the natural outcome of *chena* cultivation, as land containing under about 10 years forest regrowth is generally considered uneconomic for *chena* cultivation. In fact, in parts of the North-Western Province, Eastern Province and Uva, the primitive habit of the entire village, consisting of a few families, moving along with the cultivation, persists to a limited extent. *Chena* cultivation is often undertaken in the vicinity of permanent cultivation, chiefly paddy (rice), where there is forest available, to augment the villager's meagre income. In the wet and montane evergreen forests, as stated earlier, *chena* cultivation is more of a sporadic nature rather than a regular practice. It is either a precursor to permanent cultivation or the establishment of "peasant settlements", or, especially in recent years, encroachments into the Crown forests; such encroachments have been stimulated by the shortage of food during the last War and subsequently. Emergency Food Production permits have also been issued by the Government during the war. Such permits have generally been for *chena* cultivation in the wet evergreen and montane forests, savanna and grassland. Often steep and rocky slopes subject to erosion, have been cleared for this purpose. The grant of swampy low-lying land (*deniyas*) for paddy cultivation has often been associated with such encroachments into adjoining forest for *chena* cultivation.

MODERN PRACTICE AND MODIFICATIONS

Chena cultivation in any type of forest follows the same rigid lines as in other tropical countries. The forest is felled in the dry season prior to the monsoonal rains, the south-west or north-east monsoon as the case may be.

In the dry mixed evergreen forests, only one cultivation in the north-east monsoon (from October to January) is ussually possible. The drying winds prevalent during the months of May to July are conducive to rapid

drying and easy burning. The more complete the burn, the less the incidence of weed growth in subsequent years. Stumping of trees is seldom done. In the dry zone a rough palisade of branchwood is erected round the *chena* to keep out wild animals, chiefly the elephant and wild-boar. The *chena* is usually cultivated with short term crops of maize, varieties of millet, cassava, capsicum, pulses and vegetables. The land is usually cropped from one to three years and then abandoned, except in the wet evergreen forests, where permanent cultivation may follow.

CO-OPERATIVE ("*TAUNGYA*") REAFFORESTATION

The Forest Department in Ceylon was not slow to realize the possibilities of utilizing *chena* cultivation (as in Burma) for the formation of forest plantations in forest reserves. The earliest forest plantations so formed date from about 1890 in the "intermediate" evergreen forests, where jak (*Artocarpus integra*, Merr.) and mahogany (*Swietenia macrophylla* King and *S. mahagoni* Jacq., mainly the former) were planted and in the dry mixed evergreen forests, chiefly in the Eastern Province, where teak was the principal species planted. These schemes have developed steadily and are in vogue, but on a somewhat restricted scale, at the present day. The method consists briefly in selecting suitable blocks of forest in units of usually more than 10 acres, and entering into legal "Co-operative reafforestation" agreements with suitable lessees for a 3-year period. The lessee fells the area, the utilizable trees are extracted and the area is burnt in the usual way. The lessee fences the land with barbed wire supplied by the Forest Department. He then dibbles teak or jak seeds, regularly spaced, usually 10 feet apart (in the early stages it used to be as close as 5 feet or 6 feet apart), and in between, he is allowed to plant approved food crops such as cassava, bananas, papaw and vegetables. The lessee is expected to keep the area free of weeds and interference from the food crops until the forest plants are established. At the end of the third year, the lessee usually hands back the land fully planted to the Forest Department. Stump planting of teak is now adopted as far as possible. Mahogany is usually underplanted in the jak stand at the end of the third year. Other species which have been planted along with teak in the dry mixed evergreen forests are margosa (*Azadirachta indica* A. Juss.), satin and ebony; with jak in the intermediate evergreen forests, *milla* (*Vitex pinnata*), *Alstonia macrophylla* Wall., *pihimbiya* (*Filicium decipiens* Thw.) and teak have all been planted with varying degrees of success. In the wet evergreen forests, similar planting has been attempted but with less success. In all, 6,685 acres of plantations in the dry mixed evergreen forests, 4,037 acres in the "intermediate" evergreen forests and 1,672 acres in the wet evergreen forests have been raised by this method. Of this about one half, chiefly in the dry and intermediate forest types may be considered very satisfactory, and compare favourably with artificial plantations raised by other means. Failures, especially in the wet evergreen forests, may be attributed to unsuitable choice of species (e.g. jak has generally failed in the wet evergreen forests), or faulty selection of site, chiefly too rocky or steep areas with shallow gravelly soils. Some of the older plantations created in this way have already yielded timber of good quality, and especially during the war years (1940–1945) have been of great value for the supply of timber and poles for hutments, firewood and

[Photo by Survey Department.

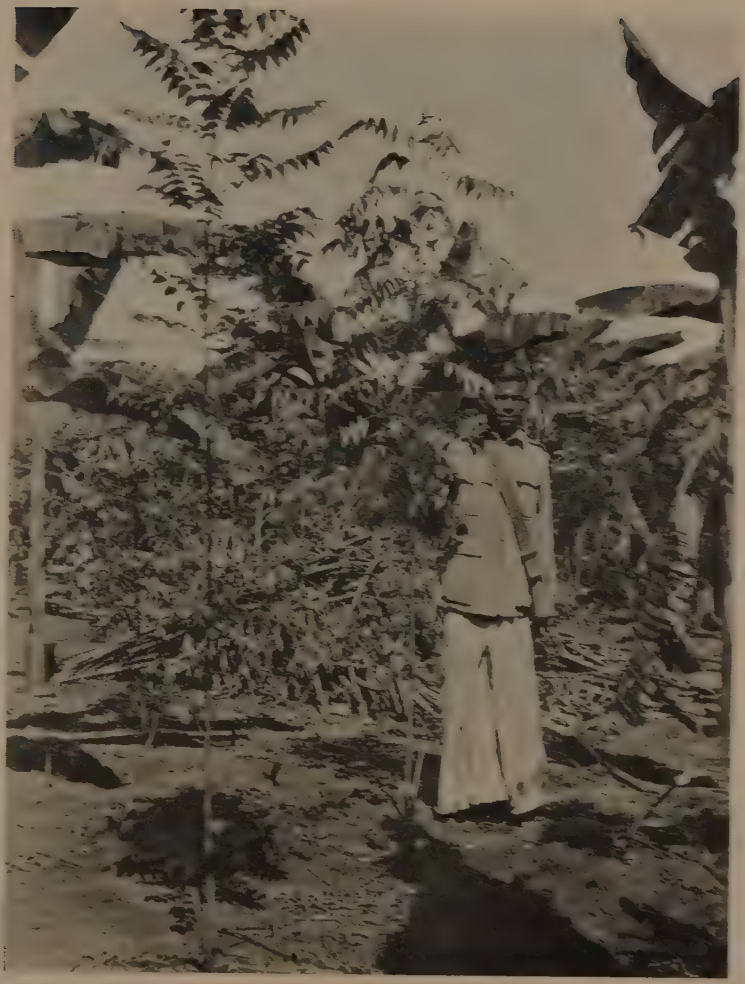
Photo. 1.—Chena reafforestation area, wet zone—Paradeniya in Kegalla District. One year old, first crop of manioc (Manihot utilissima) recently uprooted. Tree crop of Nedun (Pericopsis mooniana) too small to be seen in photograph. Note rubble stone contour bunding with manioc sticks piled contourwise between them. Some pineapple and papaw are also to be seen.

(*Block by Survey Department.*)

Photo. 2.—*Chena* reafforestation—Intermediate zone. Eight year old stand of Jak (Artocarpus integra Merr.), Marukwatura in Kegalla District, raised under the Co-operative Reafforestation system and under-planted with Swietenia macrophylla.

(Block by Survey Department.)

Photo. 4.—Chena reafforestation—Dry zone, Tiraliodai in Batticaloa District showing type of palisade fencing for protection of cultivation against red deer, sambhur and wild pig. Typical dry mixed evergreen forest in the background.



(Block by Survey Department.)

Photo. 5.—Chena reafforestation—Dry zone, Batticaloa District. Two year old area after extraction of manioc. Note heap of manioc sticks, and plantain 10′ × 15′. Tree crop—Azadirachta indica, planted 10′ × 5′.

(*Block by Survey Department.*)

Photo. 6.—*Chena* reafforestation—Dry zone, Hambantota District, Middeniya Reserve. Seven year old teak plantation with under-planted Mahogany raised by Co-operative reafforestation. The average girth of teak is 21 inches and the average height about 35 feet.

recent Editorial of the Tropical Agriculturist (Vol. CIV. No. 1, 1948): "In Ceylon there is no tradition of rotation agriculture on dry lands and there does not exist a peasant community who will readily adopt such a system of their own volition. In fact, the "chena" cultivator cannot escape from the jungle because he lacks the means, financial and physical, of clearing the land sufficiently to permit the use of implements. Something has been done to work out systems of rotations suitable for the dry zones of Ceylon", but further research is necessary before a suitable system of agronomy for the dry zone can be evolved. Until such time as a clear and progressive policy on these lines is arrived at, the practice of *chena* cultivation cannot be entirely obviated, so that some form of control is necessary to minimize its ill-effects. In the dry mixed evergreen forests, wherever control by the Forest Department is possible, *chena* cultivation can be often effectively combined with the establishment of useful plantations. Where this is not possible, for instance, in inaccessible dry mixed forest areas under the control of the Revenue Department, *chena* cultivation should be confined to a delimited forest zone and a proper system of rotation of *chenas* adhered to, as far as possible. Excessive burning should be avoided and State aid given to encourage the cultivator to protect his *chena*, market his crops successfully and cultivate it systematically for as long a period as possible.

In the wet evergreen and montane forest zone, *chena* cultivation in its recent form of encroachments on Crown land will continue to appear wherever population pressure is being experienced, for instance, in the south-west coastal belt of the Island, with lack of available land for settlement of the peasants. Unlike in the dry zone, *chena* cultivation in the wet and montane zone is now too often a step towards illegal possession. The new Government policy of acquiring suitable privately owned land (chiefly rubber and tea plantations) for the settlement of landless villagers is a step in the right direction.

ECOLOGICAL CHANGES IN RELATION TO CHENA CULTIVATION

On account of the large extent of forests brought under *chena* cultivation in Forest Reserves during the war years (1939–1945) and subsequently abandoned, a series of observation plots were laid down in 1947–48 by the Forest Department in all types of forests to investigate the possibilities of the rehabilitation of these areas by fostering the natural regeneration of tree species. Counts were made of all regeneration, seedling, unestablished, established and saplings of all tree and shrub species in abandoned *chenas* of different ages. In the dry mixed evergreen forests, the ecological succession to forest, in particular the regeneration of preferred tree species is extremely sparse and slow. The first stage after the abandonment of cultivation is the appearance of shrubs including chiefly *Calatropis gigantea* Br., *Cassia auriculata* L., *Randia spp.*, *Zizyphus spp.*, *Carissa spinarum* L. and herbaceous species. The absence of seed-bearers and the damage which follows grazing by cattle and goats retard the establishment of timber species. In abandoned *chenas* of 2–3 years old re-growth, established plants of tree species (mentioned earlier in this paper) are less than 50 to the acre, while seedling and unestablished regeneration seldom exceeds 500 plants per acre. This method will be extended to *chenas* of older re-growth, but observations made so far

indicate that the ecological change to a forest type is so slow that the rehabilitation of *chenas* by natural regeneration alone is impracticable. Instead, attempts are being made to introduce plantations in such areas by the co-operative system described earlier, inducing suitable lessees to take up these degraded areas by the inclusion of equivalent extents of the adjoining unfelled forest. Slightly better results have been obtained in the "intermediate" evergreen forests, but natural regeneration is still insufficient. The adoption of co-operative reafforestation is, however, often precluded by the steep nature of the clearings and impoverished soil conditions making further disturbance and exposure of the soil undesirable. In the wet evergreen forests, the results are very variable. In some forests, natural regeneration is quite appreciable while in others, it is poor. For instance, in Viharakelle Forest Reserve in the south-west wet evergreen forest zone over 700 established plants and roughly over 3,000 seedlings and unestablished plants to the acre were observed. As a contrast, in Masmullakelle Forest Reserve in the near vicinity only 55 established and 300 unestablished plants and seedlings to the acre were observed. The ecological succession from scrub to forest is retarded by fire, the normal succession from the scrub sere, characterized as the *Hedyotis fructicosa* L.—*Melastoma malabathricum* L. (or *Osbeckia aspera* Bl.) associes to forest being deviated to fernland with *kekilla* (*Gleichenia linearis*) or more rarely grassland. In the latter types, regeneration of tree species is naturally poor. The principal tree species which appear in the early seral stages are *milla* (*Vitex pinnata*), *welipenna* (*Anisophyllea cinnamomoides*), *walukina* (*Calophyllum bracteatum* Thw.) *godapara* (*Dillenia retusa* Thumb.), *diyapara* (*Wormia triquetra* Rottb.), *del* (*Artocarpus nobilis* Thw.) and *pepaliya* (*Aporosa latifolia* Thw.), all useful timber species. The possibility of utilizing natural regeneration as the method of rehabilitating some of the wet evergreen forests destroyed by *chena* cultivation has been amply demonstrated.

SOIL FERTILITY AND CHENA CULTIVATION

Joachim has carried out an investigation to determine (*a*) whether the adoption of the *chena* system of cultivation is necessitated by the reduction of soil fertility and (*b*) the rate of recuperation of the soil during the period of re-growth. His results indicate that the reduction of soil fertility is not incompatible with any system of rotational cropping. The factors limiting the continuance of cultivation are chiefly weed growth, the lack and impracticability of tillage, and in some areas, soil erosion. Joachim's results are however open to question as the initial choice of site has not been fortunate. In fact most of the areas selected were *degraded* forests before cultivation, so that no marked change in an associated degenerate soil type could be expected. Mention has already been made of the Forest Department scheme to include such abandoned *chenas* within the co-operative reafforestation ambit. The growth of introduced forest tree species on such sites has been strikingly poor in comparison with adjoining high forest sites. This clearly shows that there is a fall in the soil fertility gradient between actual high forest and abandoned *chena*. The invasion of weeds which is regarded as a retarding factor in the agricultural usage is normally what one associates with soil exposure and its impoverished condition.

2——J. N. A 92215 (10/49)

CONCLUSIONS

The question of soil fertility in relation to *chena* cultivation and the period of fallow required for successful rotational cultivation requires further investigation, especially for the dry mixed evergreen forest types. Natural regeneration as a means of rehabilitation of forests impoverished by *chena* cultivation in the dry mixed evergreen types is not successful ; the simultaneous raising of crops (co-operative reafforestation) in Ceylon has had a great measure of success and with careful choice of site and species, this method is capable of wider application than hitherto. The solution to the problem lies, however, in the introduction of better agricultural methods combined with better facilities for health and education. Unless a radical improvement in these respects is afforded to the peasant, no substantial progress from the primitive method of *chena* cultivation can be expected.

ACKNOWLEDGMENT

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The Future of the Natural Rubber Industry in Ceylon

By

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CEYLON'S rubber industry is today facing another crisis—and perhaps one worse than those it has so far faced and weathered. Before the war, natural rubber had no rival. There was overproduction, and competition between the various producers had forced prices down to what were considered to be hopelessly uneconomic levels. But a "restriction of production" scheme was formulated by which supply and demand were equalized, and for some years just prior to the war natural rubber enjoyed a safe and steady market.

The war changed this for ever. When the major sources of natural rubber were lost to the enemy, the urgent necessities of war so hastened research on substitutes that synthetic rubber became a commonplace. It was at first nothing more than a substitute for natural rubber, and not a very good one at that, but it served its purpose. American ingenuity and efficiency were not content to let synthetic rubber remain as a rather poor substitute for natural, and there has been, and still is, steady and continued improvement. Natural rubber now has a worthy competitor—one which already is nearly as good, and one which is likely to improve further.

There has been a widespread belief in recent months that much of natural rubber's troubles were caused by the mandatory use of synthetic rubber in the U. S. A., but this appears to be self-delusion, for the actual use of synthetic rubber is approximately twice the mandatory amount. Furthermore, the cost of synthetic rubber is believed to be slightly higher than natural rubber. Manufacturers appear to use synthetic rubber of their own free will, because they like it and not because they must. This at first sight suggests that synthetic is a better product than natural rubber. The answer to this, from the manufacturer's point of view, is that the many advantages in the manner in which synthetic rubber is supplied to him outweigh its defects when compared with the natural rubber available to him.

It is worth while at this stage to consider the relative merits of natural and synthetic rubber. In the first place, there is not one, but many synthetic rubbers. At any one time, a considerable number—perhaps as many as 40—different types are available and in demand. New ones are continuously being added, usually at the expense of an older type. Some of these types have specialized application depending on, say resistance to oil (Neoprene), or low permeability to air (Butyl), and in such cases, since the synthetic product is more suitable for its purpose than natural, it has permanently supplanted natural rubber. Natural rubber must face the continued loss of specialised markets as new and better types of synthetic for particular purposes are evolved.

Most of the world's natural rubber is used in the tyre industry, and it is here that the decisive battle will be fought. A very recent review of the relative qualities of natural versus synthetic (GR. S and Cold Rubber) sums up the situation as follows: "Cold Rubber is an improvement over GR. S. in most of its laboratory properties. It is not, however, the equal of natural rubber, and cannot be expected to do away with the need for natural rubber". (J. H. Fielding, The Goodyear Tyre and Rubber Co., Akron, Ohio.) (Industrial and Engineering Chemistry, August, 1949, p. 1560). Natural rubber has two qualities in which synthetic is far behind—those of self adhesion and of resilience. When these factors are of importance, as in tyre carcases and in the treads of larger tyres, natural rubber is invariably used. In large tyre treads, heat build up is the important factor limiting tyre life, but with smaller tyres this factor becomes of secondary importance to other characteristics such as abrasive wear and resistance to cracking and growth of cuts. For the present, the combination of the new Cold Rubber and new furnace blacks appears to give definitely better abrasive wear than natural rubber. The evidence concerning cracking and growth of cuts is not clear, but natural certainly has no marked superiority. A small, passenger car tyre with a natural rubber carcase and a synthetic tread may be just as good a tyre as an all natural rubber one.

The real advantages which synthetic holds over natural rubber are psychological ones. Synthetic rubber is regarded as a new and constantly improving material. New modifications are welcomed and their potentialities explored by user and producer working in close co-operation. By contrast natural rubber is treated as a substance of which the full potentialities are already known. Research is geared to the synthetic industry, with its promise of spectacular results. There is unbounded confidence, based on the present rate of progress, in the future, and a widespread belief that sooner or later—perhaps in five years, perhaps ten—synthetic will oust natural completely. It is this psychological superiority that is so dangerous to natural rubber at the present time, for it affects not only the manufacturer and the research man, but also the consumer, who is becoming synthetic minded. He hears so much of the good points of synthetic rubber, and he knows there has been great progress in the last few years, so that he is beginning to believe that synthetic has already got the natural product beaten.

This is a gloomy picture for the future, but it is largely the result of the lethargy of the natural rubber industry in not changing from its pre-war traditions and methods when natural rubber had no competitor. *No one denies that the better grades of natural rubber as at present produced are definitely superior in general qualities to any form of synthetic rubber so far produced.* If the qualities of natural rubber could be further enhanced and if the marketing organization of synthetic could be adapted to natural rubber the advantage which natural has over synthetic at the moment could be appreciably increased.

Synthetic rubber is marketed as a "clean" product, and each batch is uniform and is supplied with specifications concerning its physical and processing characteristics. Wartime concentration on synthetic rubber has led to a generation of technicians who appreciate this uniformity and technical grading and who do not appreciate the variable unknown material

sold as natural rubber. Moreover, the general trend in processing is to use more and more severe conditions which serve only to emphasise the present defects of natural rubber.

Complaints of dirt in natural rubber are widespread. Dirt is associated with cracking in the finished product, and must be removed by washing, an expensive operation not necessary with synthetic. Even the best rubber is prepared from latex passed through 50 or 60 mesh sieves, which remove only macroscopic, but not microscopic particles, and there is some evidence that such fine particles may be responsible for the start of cracks in treads. Obviously every attempt should be made to prepare clean rubber.

Variability from bale to bale in natural rubber is a marked disadvantage when compared with synthetic rubber. Rubber is sold at present on its appearance, but apart from the obvious advantage of greater cleanliness in the higher grades, there appears to be no relation between appearance and technical characteristics. If natural is to compete with synthetic, it seems essential that grading on specification should come into being. The technical advisers of the natural rubber industry are unanimous on this point. Technical grading and the production of large batches of clean uniform rubber appear to be the minimum essential defensive steps necessary in the competition with synthetic. The value of different grades of rubber—i.e., hard or soft—to the manufacturer is not known, and can only be ascertained by experience, in which process it is essential that the producer takes a lively interest.

A start has already been made on technical grading by French Producers in which No. 1 and No. 2 R. S. S. are tested and each bale marked on a dual basis of viscosity and rate of cure. Other rubber producing countries will probably follow suit and in the near future. At a recent conference in Malaya on Quality in Rubber, the delegates voted unanimously that in their opinion it was desirable to introduce as rapidly as it is practicable a system of technical grading for solid rubber.

It seems reasonably certain that within a limited period much of the rubber from the East will consist of clean, uniform, technically graded material. Within this preliminary framework there must be intensive research on the improvement of the intrinsic properties of natural rubber and on special applications for the speciality rubbers. There will not be one natural rubber, but several, each one particularly fitted to its own special purpose.

In the long run, with natural and synthetic rubbers approximating more closely in their qualities to one another, cost may well be the determining factor. It has been claimed that the present synthetic industry is subsidised by the U. S. Government. Whatever the truth of these claims might be it seems that there is little likelihood of an increase in price when the industry becomes independent of Government. An appreciable fall in the price of either natural or synthetic rubber would undoubtedly help that particular rubber to a larger share of the joint market.

The world's potential output of natural rubber is steadily increasing. Seedling rubber gave about 500 lbs/acre/annum ; the best of the earlier clones gave more than double this amount, and the best of the modern clones are expected to give four times this amount. Replanting is proceeding apace

in many countries, with Ceylon far behind the rest. This is not the whole story, either. Between the the two wars, American interests started up rubber plantations in South America, among other places. These areas were decimated by the South American leaf blight—*Dothidella Ulei*. Work during the last 10 years under the direction of the U. S. Department of Agriculture has enabled selections to be made which are resistant to this scourge and at present extensive work is in progress in eleven tropical American countries to develop rubber production, primarily by smallholders.

There is every prospect that the potential output of natural rubber will exceed the demand, unless vast new uses can be found, such as rubber roads. Competition in the rubber industry itself will tend to force down prices which are already low by pre-war standards. Only the more efficient producers will be able to keep going.

A further point of interest is that since natural rubber came onto the market again after the war, the price differential between the good and the poor grades has steadily increased, Although rubber is at present sold on appearance, the bigger purchasers buy on the technical qualities of the various grades and the price differential really represents the extra cost to the user in turning a low grade rubber into a high grade one. This extra cost includes not only extra processing such as washing, but also the value of increased rejects. The actual extent of the price differential may be expected to remain steady, even though the price of rubber falls. So that, in such a case, it would just not be worth while to produce low grade rubber. When overproduction does arrive, it will be the clean, uniform, specified grades of rubber that will find ready sale at the expense of the poorer grades.

How will all this affect Ceylon ? The present organization of the Rubber Industry in Ceylon is ill adapted to take part in this fight for survival. Her total production is less than 1/10 of the Far East total, and any action the Dominion takes may not vitally affect the struggle between natural and synthetic rubbers. But if the Dominion wishes to retain her share in whatever market for natural rubber may exist in the future, it is imperative that we should be able to offer rubber in quantity of a standard not below that of other producing countries.

Uniform rubber can only be produced where facilities for bulking latex exist. Specified rubber means that technical tests have to be carried out on each batch of rubber. At a very rough estimate the cost of a single specification will be of the order of Rs. 10-20. It would be quite uneconomic to test each and every bale, and the lower limit at which testing would be feasible is suggested at approx. 2 tons, or in round figures, 1,000 gallons of latex. Few of Ceylon's factories are equipped for handling latex in bulk at this level.

Better rubber, so far as Ceylon is concerned, means centralized factories capable of bulking at least 1,000 gallons latex, and preferably double or treble this amount. Such factories could turn out clean, uniform rubber which could be specified at little cost. In some cases, groups of estates could amalgamate. In other cases, it might be necessary for new factories to be built to handle both estates and small holders' latex. Proposals for centralization on purely economic grounds were made in the Report of the Commission on the Rubber Industry in Ceylon in 1947—" We feel that reorganization

is bound to come sooner or later, if Ceylon is to compete with her better organized neighbours further east ". This economic need has now been changed to *essentiality* if Ceylon is to fall in line with the rest of the East and produce clean, uniform graded rubber.

The reorganization of Ceylon's industry into units of 1,000–2,500 acres, each with its central factory, will not be an easy task, particularly on the administrative side, and will entirely upset the present system of handling rubber between estate and ship. Other countries are also faced with these complications—" the erection of central factories also involves certain consequences on the selling side, as it is natural to assume that the selling of the products of the central factory will in most cases (although not necessarily) no longer be a matter for the individual estates. It is hoped that the higher interests which are here at stake will make it possible to conquer these complications ". (Dr. H. R. Braak, De Bergcultures, September 1, 1949.)

In the years to come Ceylon's rubber acreage may be reduced to a fraction of the present value, clustered round central factories, with a total output probably higher than the Dominion's present figure. Smallholders will have their part in the industry as well as the bigger estates for the Central factories will collect and purchase latex. With lowered production costs, through high yielding material and through efficient factories, and with a better product, made possible by these same efficient factories, there need be no undue pessimism about the future of natural rubber in Ceylon. The days of fabulous profits are gone for ever, as the industry settles down to maturity but there are good grounds for the hope that there will be reasonable recompense for efficient producers for many years ahead. The lesson to be learned is that synthetic rubber is no longer a substitute for natural rubber ; rather is natural rubber to be regarded as one of a range of alternative materials to be selected or rejected entirely on its merits according to the particular requirements to be satisfied. It is up to the natural rubber industry to make the best of the inherent merits of its product, and to see that those merits are widely known.

The Improvement of Paddy Yields in Ceylon

BY

D. RHIND

THE official estimates of the yields of paddy in Ceylon is only 13 bushels per acre (*vide* page 68 of this number). While there is doubt as to the reliance which can be placed on this very low figure there is no doubt that yields are generally much below what they need be. The standard of cultivation nearly everywhere is depressingly low. For many years before the war cheap imported rice from Burma and Siam so depressed the internal paddy market that there was scarcely any margin of profit in paddy growing at the low yields which traditional field practices entailed. There was no monetary incentive to do better and no urgency. Today prices are four to six times as high and there is also a guaranteed minimum price of Rs. 8 per bushel of paddy. The profit motive is therefore strong at present but amongst villagers there persists a notion that nothing can be done to increase yields; at least nothing which is within their reach and at the same time profitable to apply. Another deterrent in the form of malaria has also been very largely eliminated and is no longer a limiting factor. Feeling confident that much greater yields could be obtained by methods which enabled weed control to be effective and which decreased the risks inherent in broadcast crops, a series of village demonstration plots was initiated by the Agricultural Department in *Yala* 1948 and *Maha* 1948–49. These plots took the form of small practical demonstrations, on cultivators' own fields, of methods judged likely to be effective in raising yields and within the reach of small farmers. Particular stress was laid on transplanting. This paper records briefly the results obtained from these demonstration plots compared to the yields from neighbouring, untreated fields. The figures are sometimes actual weighings but in others are estimates made by eye. They cannot therefore be regarded as having a high degree of exactitude but they are considered sufficiently reliable to indicate the kind of response to improved cultural practices which can be expected in Ceylon.

RESULTS OF THE DEMONSTRATIONS

Yala 1948

Range officers were rather unfamiliar with the methods it was intended to demonstrate and particularly so regarding transplanting about which some fantastic ideas as to its cost and laboriousness were widely held. Nevertheless a number of demonstration plots were laid down, the most important practices being transplanting alone or combined with manuring. There were 35 demonstrations of transplanting alone (23 in South-Central Division). These gave an average yield of 41·3 bushels per acre on the demonstration plots compared to 19·5 bushels per acre on the neighbouring broadcast fields, an increase of 111·9 per cent. Because the South-Central plots were mostly in areas where the standard of cultivation was lower than elsewhere it is best to consider them separately. When this is done the South-Central

Division demonstrations showed an average yield of transplanted plots of 44·5 bushels per acre compared to 17·0 bushels from neighbouring plots, an increase of 161 per cent. The rest of the demonstrations of transplanting alone gave an average yield of 35.4 bushels compared to neighbouring fields sown broadcast of 24·4 bushes per acre, an increase of 46·1 per cent.

These are satisfactory gains particularly if it is remembered that those doing the demonstrations were largely unfamiliar with this kind of work and the labour which had to be employed was likewise inexperienced and unhar dy. The season was also not a very favourable one. The average *increase* in the South-Central Division was 27·4 bushels per acre, to which an average saving of seed amounting to 4 bushels per acre must be added, a total increase in available paddy of 31·4 bushels per acre, worth Rs. 251·20 at the minimum controlled price of Rs. 8 per bushel, but worth Rs. 376·80 at the then prevailing price of Rs. 12 per bushel. For the other demonstrations the cash value of the gain was Rs. 174·40 per acre.

Demonstrations of transplanting combined with manuring (some green manure, some artificials) numbered only 12. They gave increases of from 34·7 to 51·7 bushels of paddy per acre, an average increase of 49 per cent. Comparing all demonstrations involving transplanting with all others not involving transplanting there was an average increase of 68.3 per cent. in favour of transplanting. Thus, while substantial improvements are possible by methods other than transplanting, such as harrowing the standing broadcast crop, manuring, weeding, selected seed, &c., the added advantage of transplanting was very large.

Since transplanting cannot be done everywhere the improvements to be had from other methods must not be neglected. There were 14 demonstrations of the use of improved mould-board ploughs followed by harrowing the standing crop when it was about three weeks old. The treated plots gave an average yield of 32·5 bushels per acre compared to the untreated plots at 19·8 bushels, a gain of 64·1 per cent. Fields ploughed and green manured gave an average increase of 5.5 bushels per acre, or 34·8 per cent., worth Rs. 44 at the minimum price. These practices are easily within the capacity of any farmer. Too much should not be deduced from these preliminary demostrations but they serve to indicate the large improvements which are possible.

Maha 1948–49

A considerably larger number of village demonstration plots were laid down in the North-East monsoon season of 1948–49. The combinations of treatments varied so much that broad grouping has been necessary to derive the essential information on the principle treatments. These show quite clearly the improvements in yields which certain cultural methods confer, though it is not justifiable to deduce too much regarding the probable magnitude of the response from the arithmetic mean differences becasue of the widely varying conditions and levels of cultural efficiency in different localities. The purpose of this note is not so much to assess the probable degree of benefit from any particular practice which has been demonstrated as to emphasise the overall improvement which is possible in the general average of rice yields in Ceylon.

Table I gives the results of 534 demonstration plots after broadly grouping the treatments for ease of presentation.

TABLE 1

Results of Village Demonstration Plots in Maha 1948-49

Division	No. of Demonstrations		Control	Transplanting		Other Cultural Methods		Manuring		Transplanting and Other Cultural Methods		Transplanting and Manuring		Other Cultural Methods and Manuring		Transplanting and Other Cultural Methods and Manuring	
			Bushels per acre	Bushels per acre	Per cent. increase	Bushels per acre	Per cent. increase	Bushels per acre	Per cent. increase	Bushels per acre	Per cent. increase	Bushels per acre	Per cent. increase	Bushels per acre	Per cent. increase	Bushels per acre	Per cent. increase
South-Central	234		27·75	52·5	89·2												
Central	102	12	14·8	20·5	38·5												
		19	16·0			25·7	60·6										
		15	20·4					28·1	37·7								
		9	26·8							42·6	59·0						
		8	18·2									31·9	75·3				
		13	23·0											35·8	55·7		
		27	28·2													46·8	66·0
South-Eastern	86	26	17·0	28·0	65·3												
		3	24·6			42·2	71·6										
		1	16·0					33·0	106·2								
		32	17·3							23·8	37·6						
		22	20·4									—	—	37·1	81·9	71·5	142·4
		2	29·5														
South-Western	62	37	31·5	50·1	59·0												
		25	21·5			24·6	14·4										
North-Western	36	9	30·6	55·1	80·0												
		3	37·7			48·7	29·2										
		2	19·5					—	—	34·0	74·4						
		22	27·6									—	—	—	—	40·5	46·7
Vavuniya	9	2	21·2	60·5	185·4		—										
		4	33·3					—	—	59·5	78·7						
		2	28·7											28·0	40·0		
		1	20·0														
Eastern	4	1	28·0	52·0	85·7												
		3	23·7			29·3	23·6										

There were actually many more demonstration plots laid down than the 534 here reported but owing to long delay in threshing, following the common practice of stacking for a considerable period after reaping, not all results have been reported. It is, however, necessary to present a general picture of the possibilities in order to plan future demonstration programmes.

Transplanting alone and in combination with other cultural treatments provides the greatest volume of data, particularly from the South-Central Division where a concentrated drive to introduce this practice has been launched. The weighted mean yield of the transplanted plots in the South-Central Division is 52·5 bushels per acre against an estimated average yield of neighbouring plots of 27·75 bushels, an increase of 89·2 per cent. without counting the amount of seed saved by transplanting. This increase of 24·75 bushels of paddy represents a value of Rs. 297 at the current local price of Rs. 12 per bushel. To this the saving of about 4 bushels of seed must be added, a gross gain of Rs. 345 per acre. Allowing for as many as 10 women-days for the work of transplanting and 2 man-days for accessory work, the extra cost would be unlikely to exceed Rs. 20 per acre. Large responses were also recorded to transplanting in all other Divisions, the increases varying from 38·5 to 185·4 per cent. Failures were very few and were all due to understandable causes such as the use of seedlings which were too old, floods or drought.

The benefits from other cultural practices were also marked. These practices included harrowing the standing broadcast crop when about three weeks old, the use of improved ploughs and harrows, clean weeding, &c. The increases ranged from 14·4 to 71·6 per cent. over the controls. Manuring alone was adequately tested only in the Central Division where it gave an average increase of 37·7 per cent. This corresponds with the results previously obtained on many test plots in Ceylon. When transplanting was combined with other improved cultural practices and the use of manures the results were roughly cumulative in the Central and South-Eastern Divisions, the highest recorded average yields of 46·8 and 71·5 bushels per acre being from these treatments.

The overall picture of this series of small demonstration plots shows that very substantial improvements in yields are possible by methods which require no elaborate or expensive appliances and which are within reach of the small farmer. The need is to induce the small farmer to adopt such changes in his traditional practices as are necessary. With the slight data available it would be wrong to attempt to reach any exterpolated estimate of the possible average yield of Ceylon, but it may be noted that the crude average yield of the untreated plots in this series was 24 bushels per acre and of the treated plots (all treatments) 40 bushels per acre.

ACKNOWLEDGEMENTS

My acknowledgement are due to many members of the Agricultural Department who have carried out the demonstrations and whose data I have utilized. For the summarizing of the data I am indebted to Dr. Chandraratna, Botanist and Senior Agricultural Research Officer.

Ceylon Paddy Statistics

(Furnished by the Director of Census and Statistics, Colombo)

Season Year	Extents sown (Acres)	Yields—Paddy Bushels	Long Tons	Metric Tons	Rice available for consumption Metric Tons*
Maha, 1943–44	680,919	9,119,013	182,380	185,275	107,088
Yala, 1944	349,313	4,447,192	88,944	90,356	52,226
Total 1944	1,030,232	13,566,205	271,324	275,631	159,314
Maha, 1944–45	633,563	7,900,411	158,008	160,516	92,778
Yala, 1945	262,097	2,900,059	58,001	58,922	34,057
Total 1945	895,660	10,800,470	216,009	219,438	126,835
Maha, 1945–46	610,070	7,847,668	156,953	159,444	92,159
Yala, 1946	317,008	3,502,851	70,057	71,169	41,135
Total 1946	927,078	11,350,519	227,010	230,613	133,294
Maha, 1946–47	616,507	8,013,348	160,267	162,811	94,105
Yala, 1947	310,176	3,506,982	70,140	71,253	41,184
Total 1947	926,683	11,520,330	230,407	234,064	135,289
Maha, 1947–48†	616,507	8,013,348	160,267	162,811	94,105
Yala, 1948‡	343,055	4,344,562	86,891	88,270	51,020
Total 1948	959,562	12,357,910	247,158	251,081	145,125
Maha, 1948–49‡	624,745	8,321,427	166,429	169,071	97,724
Yala, 1949†	342,842	4,323,826	86,476	87,849	50,776
Total 1949	967,587	12,645,253	252,905	256,920	148,500

* Total production of paddy (less 15 per cent. seed allowance) converted into rice. Extraction rate 68 per cent.

† Estimates.

‡ Provincial.

Explanatory

The figures for 1943 to 1947 were collected under the Internal Purchase Scheme. The figures from 1948 onwards are based on returns furnished by the D. R. OO to the Director of Census and Statistics. During the operation of the Internal Purchase Scheme, there has been a tendency to under-assess extents sown and yields. This tendency still appears to continue.

Rubber in Road Construction*

IT is not always realized that by far the greater part—(about three quarters)—of the world's rubber production is used in the manufacture of tyres. For some time there has been intensive research into alternative outlets for rubber, and one of the most promising of these is the use of rubber in road construction. Rubber has been used in roads for many years in the form of blocks, or sheets, and usually in vulcanised form. The principal advantages of such roads are their great durability, the deadening of traffic noise, and their freedom from dust. Such rubber "carpet" roads are unfortunately, very expensive and so they are normally found only in strategic places such as the vicinity of hospitals, &c.

Modern road construction normally takes the form of a foundation of large stones, on which rests a layer of smaller materials cemented together either by concrete or bitumen, with a thin surfacing and sealing layer. This surface layer not only seals the surface against water penetration, but has to withstand the passage of traffic. It must withstand the sudden impact of traffic and yet it must not soften in summer nor become brittle in winter. It has been found that the road surfacing properties of bitumen are appreciably enhanced when rubber powder is mixed with it to the extent of 5–10 per cent. It is claimed that rubberised roads last longer and that they stand up to traffic better, and that the surface has better anti-skid properties than the normal bitumen surface.

Although research on bitumen rubber complexes has not been restricted to Holland or its Empire, most of the work on road construction has originated with the Rubber Stichting, the Dutch centre for Rubber Research. Two types of rubber powder have been investigated, one produced from latex sprayed into hot air and the other by flocculating latex in the presence of certain chemicals which prevent the tiny particles of coagulum from adhering. This latter product is known as "Mealorub", and appears to be the more satisfactory form of rubber powder for roadmaking.

Some 30 test areas were laid down by the Rubber Foundation in Holland in the five years before the war. These rubberised roads received very little attention during the war and some of them were subjected to extremely hard wear. All reports agree that these roads "stood up to it" much better than the control stretches. Similar test roads in Indonesia again subjected to maintenance neglect and to heavy military traffic also stood up much better than the control stretches.

These encouraging results have led to widespread interest in this new form of road construction, and further test areas are being laid down, notably in the U. S. A. Although the percentage of rubber used is small (5–10 per cent.) and is restricted to the road surface, the amount of rubber per mile of road ranges from one third of a ton to a ton. The initial cost of the rubber may be placed very approximately at Rs. 1000 ; this amounts only to about 2 per cent. of the total cost of road building, and it is highly probable that this slight extra cost will be far outweighed by the resulting longer life and lower maintenance costs.

If rubberised roads fulfil their early promise and are generally adopted, it is estimated that the increased consumption of rubber in the U. S. A. alone for this purpose might amount to as much as 200,000 tons per annum, or 10 per cent. of the world's annual production of natural rubber.

E. P.

* The use of Rubber in Bituminous Road Construction and some other applicattions of Rubber containing Bitumen 1949. Communication No. 96 Rubber-Stichting, Delft, Holland.

Reviews

IN No. 1 Monographs on Tea Production in Ceylon, Dr. T. Eden summarizes the work done by the Agricultural Chemistry Department of the Tea Institute during the period 1927–1948.*

Instead of detailing the numerous activities of the department, Eden has judiciously chosen to confine his treatise to a description of the positive experimental data from which scientific deductions have been made and has enucleated their practical bearing on tea cultivation.

Eden's past association at Rothamsted with Professor R. A. Fisher, whose revolutionary statistical methods on the possibilities of properly controlled field experiments had just reached fruition, undoubtedly roused his enthusiasm to put Fisher's methods into operation, for the first time in Ceylon in a series of field experimental trials on tea. In attempting this, Eden's initial task was a formidable one as a field technique had to be evolved. Apart from the very great heterogeneity in soil fertility to be contended with especially across the contours on tea estates, there were such factors as the individuality of the tea plucker and the innumerable leaf harvests, the yields of which were influenced by the prevailing weather conditions, &c., that had not only to be evaluated but their militating effect on the prospect of attaining reasonable accuracy diminished in order that experiments of ascertainable precision need only be carried out. The fact that Eden has succeeded is borne out by his own statement, "no experiment of inadequate accuracy has emerged".

Eden has pointedly stressed the rather common fallacy namely that representativeness means the sampling of a large plot whereas it is the frequency of distribution of type that is important, in other words, it was always advisable to use land for securing high replication (i.e., 12 upwards) than to increase unduly the size of each plot. Mainly by applying the above principle, Eden has been able to keep down the standard errors of mean differences to below 3 per cent., and consequently significant differences above 6 per cent. are valid. The fact that it is only by correctly employed statistical examination of field experimental data that a proper interpretation is possible, should be borne in mind by all those who wish to conduct experiments with an objective.

Monograph No. 1 definitely serves the purpose for which it is meant, namely, the summarizing of the very useful information contained in the T. R. I. publications on the Chemical aspects of tea production. It is therefore invaluable to the tea planter. Moreover, the chapters on Cultivation and Weeds, Soil structure and Erosion, and Composting and Green Manuring are illuminating. Eden has succeeded in explaining very precisely the chemistry of these to all agriculturists. A bibliography of references is provided.

D. E. V. K.

* The work of the Agricultural Chemistry Department of the Institute, by Dr. T. Eden, D.Sc., Monographs on Tea Production in Ceylon No. 1. Issued by the Tea Research Institute of Ceylon. P. 78. n.p.

Mr. E. Ernest Green

THE late Mr. E. Ernest Green was the first Official Agricultural Entomologist of the Ceylon Government. Although he began his career in Ceylon as a planter in 1881 he gave much of his attention to observations on insects and during this period published several papers on the various insect pests attacking tea.

He was appointed by the Ceylon Government as Honorary Entomologist in 1897 and as permanent Official Entomologist from 1897 to 1913 during which period he made an invaluable contribution to Ceylon economic entomology by putting on record his numerous observations on the occurrence and habits of the majority of the important insects occurring at the time on the various economic crops, especially tea. Many of the insects collected by him and identified during his period of service still form the basis of the insect collection of the Department and of the compilation of the comprehensive catalogue of the insects occurring in Ceylon on economic crops and other common plants.

He was also responsible, early in his official career, for the establishment of a Plant Quarantine Station in Colombo for the compulsory inspection and treatment of imported plants.

He made a special study of the *Coccidae* or Scale Insects on which he published an excellent monograph, The Coccidae of Ceylon, which included complete and detailed morphological descriptions of each species accompanied by a full set of coloured plates, and also in many cases notes on bionomics and distribution. The work was published in 5 parts appearing in 1896, 1899, 1904, 1909 and 1922. Besides this main work on Coccidae, he has published over 200 articles on economic and general Entomology in various journals.

He resigned his post in Ceylon with effect from February 1913, having built up for the Department a foundation in the economic entomology of Ceylon on which has depended much of the subsequent progress made in this field.

B. A. B.

REPORT OF THE PROCEEDINGS OF THE INAUGURAL MEETING OF THE CENTRAL BOARD OF AGRICULTURE HELD AT PERADENIYA IN THE ASSEMBLY HALL OF THE SCHOOL OF AGRICULTURE AT 2.30 P.M. ON MONDAY, APRIL 4, 1949.

Mr. D. Rhind, Director of Agriculture, presided and the following were present: Mudaliyar N. M. Abulcassim Marakar; Rev. Fr. L. W. Wickremasinghe; Sir Wilfred de Soysa; Mr. A. Perumynar; Dr. M. F. Chandraratne (Botanist); Dissawa A. E. Madawala; Dissawa T. B. Poholiyadde, M.P.; Mr. S. Sivapalan, M.P.; Mr. P. B. Bandaranayake; Mr. H. Abeygoonasekera; Mr. H. E. C. Lushington (Conservator of Forests); Mr. R. H. Spencer Schrader, J.P., U.M.; Mr. W. P. A. Wickremasinghe, M.P.; Mr. S. A. I. Elapata, M.B.E., J.P., U.M.; Mr. S. C. Fernando, Registrar of Co-operative Societies; Major E. C. de Fonseka, M.B.E., E.D.; Mr. B. L. W. Fernando; Dissawa P. B. Bulankulama, J.P., U.M., M.P. and Parliamentary Secretary to the Minister for Agriculture and Lands; Mr. W. M. Cumaraswamy; Mr. R. T. Chelliah; Senator C. A. M. de Silva; Gate Mudaliyar M. S. Kariapper, J.P.,U.M., M.P. and Parliamentary Secretary to the Minister of Home Affairs; Mr. W. A. Guthrie, representing the Director of Irrigation; Mr. Wilmot A. Perera, M.P.; Senator (Col.) T. Y. Wright, V.D.; Hon. Mr. H. W. Amarasuriya, Minister of Commerce and Trade; Mr. C. N. E. J. de Mel, Acting Deputy Director of Agriculture; Mr. U. B. Unamboowe; Senator Justin Kotalawala; Mr. E. Abeyratne, Agricultural Research Officer, Maha Illuppallama; Mr. R. Singleton Salmon, Deputy Chairman, Planters' Association of Ceylon; Mr. S. L. B. Dharmakirti, J.P., Mr. Marcus S. Rockwood; Mr. A. Hensman; Sir James P. Obeysekera; Senator C. Wijesinghe; Mr. A. M. Clement Ḍias; Mr. H. E. S. Ranasinghe, Secretary of the Central Board of Agriculture, was absent and Mr. C. S. Ratwatte acted.

The following visitors were also present: Dr. A. W. R. Joachim, M.B.E., Mr. R. B. Thalakada, Mr. A. V. Richards.

Letters and telegrams regretting inability to attend the meeting were received from the following members:

Mr. E. H. R. Tennison, Commissioner for Development of Marketing; Mr. S. G. Taylor, Director of Irrigation; Mr. S. F. Amarasinghe, Land Commissioner; Mr. Thomas Amarasuriya, Chairman, Low Country Products Association; Mr. H. A. Peiris, Divisional Agricultural Officer, S.E.D.; Mr. P. B. Tennakoon, D.R.O., N.C.P.; Mr. E. Rhodes, Director, Rubber Research Scheme; Mr. M. B. Dedigama; Mr. E. Muthukumaru and Mr. H. E. S. Ranasinghe, Secretary, Central Board of Agriculture.

Chairman's opening address:

" Gentlemen,—It gives me great pleasure to welcome you all today and I feel sure our future deliberations will be of great value to Agriculture in Ceylon and of great benefit to my Ministry and myself in our efforts to improve the food supply. This is our main concern at the moment. I regret that there has been some delay in calling this meeting of the reconstituted Central Board of Agriculture and I particularly apologise for having had to postpone this meeting from the 21st March as I could not get back to Ceylon from the Bangkok International Rice Conference in time. I do not want to say very much at this

point but I think that with the new duties which have been assigned to the District Agricultural Committees, it is best that this Central Board concentrates on the more important efforts which can be made towards raising our food production and solving the problem of low rice yields, rather than to deal with matters of detail. The District Agricultural Committees have been given additional duties over and above what they used to have and they should deal with the details of Agricultural Production Programmes. I think it would be best in this Central Board, if we leave matters of detail to the District Agricultural Committees which are represented here and whose views can be brought to the notice of the Board through their representatives and we should then confine ourselves to the more general and more important aspects of food production. With these few words of welcome to you, I propose to get down to the minutes.

II. CONFIRMATION OF THE MINUTES OF THE LAST MEETING

Minutes of the last meeting of the previous Board, held on June 30, 1947, were confirmed without any amendments.

III. MATTERS ARISING OUT OF THE MINUTES

Senator C. A. M. de Silva: " I had the pleasure of moving a resolution in this House at the last meeting, if you turn to page 9 of the minutes you will see the resolution, and I would like to ask whether I am to move for the appointment of a sub-Committee to go into this matter at this stage under " Any Other Business ".

The Resolution referred to by Senator de Silva was:

" That this Board is of the confirmed opinion that the invaluable services rendered to agriculture by the Hon. Mr. D. S. Senanayake, Minister for Agriculture and Lands, be perpetuated in a suitable manner and that a sub-Committee of this Board be appointed to take such steps as are necessary to implement this resolution." Proposed by Mr. C. A. M. de Silva in the previous Board meeting and seconded by Mr. R. T. Chelliah.

The Chairman enquired whether the House agreed to appoint a Sub-Committee at this stage and as agreed by the House the following names were proposed by Senator C. A. M. de Silva and seconded by Mudaliyar Abulcassim Marakar:

> Rev. Fr. L. W. Wickremasinghe; Dissawe A. E. Madawala; Dissawe P. B. Bulankulama, M.P.; Gate Mudaliyar M. S. Kariapper, M.P.; Senator (Col.) T. Y. Wright; Mr. R. T. Chelliah; Senator Justin Kotalawala, and he proposed his name if the Board wished him to serve on the Committee.

The Hon. Mr. H. W. Amarasuriya inquired who the Convenor was.

The Chairman suggested Senator de Silva as Convenor.

It was also agreed that 3 should form the quorum of this sub-Committee.

Hon. Mr. H. W. Amarasuriya: " What are the terms of reference of this Committee?"

Chairman: " I presume the terms of reference will be to report to this Board suitable steps to be taken to implement the resolution moved at the previous Board by Mr. C. A. M. de Silva."

The Chairman gave the following as terms of reference of this sub-Committee: " To report to the Board on suitable steps to implement the resolution of the last Board to perpetuate in a suitable manner the services rendered to Agriculture by the Hon. Mr. D. S. Senanayake, the Prime Minister."

The terms of reference were unanimously adopted.

Hon. Mr. H. W. Amarasuriya suggested that the Committee should report in a specific time.

Senator C. A. M. de Silva: " I wish to tell my honourable friend that I will not allow grass to grow under my feet."

IV. ITEM 2 ON THE AGENDA—ADOPTION OF RULES

At this stage Mr. Wilmot A. Perera drew attention to the venue of Board Meetings: "Mr. Chairman, before we go on to discuss the Agenda may I inquire whether it would not be possible for these meetings to be held in the Board Room of the Agricultural Department?"

Chairman: "The Board Room in the Department is absolutely chock-a-block as my Finance Section is occupying it."

Mr. Wilmot A. Perera: "Cannot we find another place, because, particularly those who travel by train, find it extremely difficult to come here without any sort of conveyance."

Chairman: "There is a possibility that we might be able to find accommodation in the Royal Botanical Gardens where Lord Mountbatten had his office. Temporarily we have put in the Propagation Division there, as their roof is being repaired but when that job is done and if it is big enough we can squeeze in there."

Mr. Wilmot A. Perera: "We should be thankful to you if that could be done."

Chairman: "I will do my best to find some accommodation there. Would you please leave it to me to find other a more convenient place if possible."

Mr. Wilmot A. Perera agreed.

Going on to the subject for discussion—Adoption of rules—Gate Mudaliyar N. Wickremaratne drew attention to the fact that there were 8 Rules governing the activities of the Board and that he would like to make certain suggestions, namely that the Board shall meet once in two months and that there shall be no Executive Committee of the Board.

The Chairman drew the attention of the speaker at this stage that it was necessary to consider his first amendment to the existing rules, namely that the Board shall meet once in two months.

Gate Mudaliyar Wickremaratne: "During the previous years we used to hold our meetings once in three months, sometimes three meetings for the year but I think that now the question of food production and agricultural matters are so important that an advisory body should meet oftener and discuss current matters with the Director of Agriculture by meeting more frequently and therefore I thought that as some years ago we had this rule of meeting once in two months, we should go back to that and then meet once in two months instead of once in three months."

Mr. S. Swaplam felt that as a large number of the House represent each district to which they belong and that the work involved in the District Agricultural Committees has also to be attended to, meetings once in two months will mean a little too many for the year. He therefore suggested that the Board should meet once in three months and also he drew the attention of the Board to a suggestion that came up for discussion during a previous Board meeting that the Central Board of Agriculture should have its meetings not only in Peradeniya but in various agricultural Districts and that it would be in the interests of the country if members could visit various areas and see what is happening there and concluded by requesting the Board to consider that suggestion.

Senator Col. T. T. Wright inquired, since the speaker had suggested four meetings for the year and if one was held at Peradeniya to which districts the speaker expected them to go for the other three meetings.

Bulathsinhala Dissawa, M.P. inquired as to what purpose it served in holding meetings in various districts. He felt that unless the members were there for a number of days visiting agricultural areas it would not serve any purpose.

Mr. Singleton Salmon: "Has the mover got a seconder for that motion?"

Chairman: "Neither motion has been seconded."

Senator (Col. T. Y. Wright felt that instead of holding formal meetings outside Peradeniya it would be a good thing if the Board could arrange for occasional visits to places of agricultural interest like Bopatalawa.

The Chairman said he would rather favour Col. Wright's suggestion of having informal meetings of the Board at various experimental farms which could be treated as additional meetings but in such an event the Board would have to move a resolution in order to make provision for such meetings.

Bulankulama D'ssawa, M.P.: "That could be done by private arrangement between the Director and the members."

Hon. Mr. H. W. Amarasuriya: "It is not necessary to incorporate this in the rules." He moved that the 1st Rule be adopted as it is.

Gate Mudaliyar Kariapper inquired whether Gate Mudaliyar Wickremaratne's amendment motion had a seconder, and if not, he at least would formally second it. (*Laughter*).

The first amendment to the Rules moved by Gate Mudaliyar Wickremaratne and seconded by Gate Mudaliyar Kariapper was put to the vote and defeated.

Gate Mudaliyar Wickremaratne's amendment (*b*) was taken up for discussion, viz. —

The Board being an advisory one there shall be no Executive Committee and that the rule providing for an Executive Committee be deleted.

The Chairman said that in 1941 the same question arose and there was a discussion on the status and functions of the Executive Committee which after some discussion arrived at the following decisions:—

(1) All resolutions should be forwarded to the Minister through the Executive Committee.

(2) When a resolution is phrased in general terms without any indication of the manner in which it should be given effect to, the Executive Committee should work out details to be placed before the Ministry.

(3) The Chairman will forward the resolution to the Minister together with a minute embodying the decision of the Executive Committee.

The Chairman therefore felt that it was essential that the Central Board of Agriculture should have an Executive Committee because resolutions passed by the Board had to be forwarded to the Ministry through the Executive Committee.

Mr. Wilmot A. Perera felt that if the Board did not favour the appointment of an Executive Committee the only thing they could do about it was to ask the Minister to bring up the matter before Parliament and amend the Ordinance.

Senator (Col.) T. Y. Wright: "I do not understand why the Mudaliyar wishes to do away with the Executive Committee."

Senator Justin Kotalawala inquired whether it would not be practicable to appoint special committees to work out details and submit a report to the Ministry so that members who are specially interested in particular subjects could be selected into that Committee instead of having one standing Executive Committee.

Senator (Col.) Wright: "I do not think that the Executive Committee before, did very much good, because we used to pass resolutions and send them up but we have heard nothing more about them."

The Chairman said a sub-Committee appointed by the previous Board to report on the status of the Central Board under the new Constitution submitted their report to the Minister who has replied to the various points raised one of which is the point raised by

Col. Wright. He added that the sub-Committee had recommended that some intimation be given as to whether or not the resolutions of the Board were acceptable to the Minister and the reply received was that arrangements would be made accordingly.

Gate Mudaliyar Wickremaratne made a statement that unlike in the olden days when there was the State Council, now there is the Parliament consisting of the Minister of Agriculture, Permanent Secretaries, Parliamentary Secretaries and Private Secretaries and there is a Cabinet. He felt that when District Agricultural Committees discuss matters concerning their respective Districts and pass resolutions and send them to the Board, the Board could consider their proposals and he did not feel justified in allowing an Executive Committee to sit on judgment over 60 members who constitute the Board.

Mr. Wilmot A. Perera again drew the attention of the Chairman to the fact that if the Board was accepting the amendment the only thing it could do was to suggest to the Minister to amend the rule laid down that an Executive Committee has to function.

Chairman: " All we can do is to suggest to the Minister that the Rule be amended. Otherwise the resolution does not get any further."

Bulankulama Dissawa, M.P., suggested that as the rule providing for an Executive Committee has laid down that 10 members shall constitute the Committee it may be left as it is and instead Special Committees may be appointed whenever special subjects had to be tackled by the Board, and 2 or 3 members of the Executive Committee could also come into these Special Committees or Select Committees.

Senator Justin Kotalawala inquired whether it would not be possible to appoint Special Committees according to the nature of the needs of particular resolutions instead of having a standing Executive Committee.

Mr. W. M. Cumaraswamy also felt that Special Committees whenever necessary to go into matters were more feasible than having one Standing Executive Committee.

Gate Mudaliyar Kariapper said that an Executive Committee of 10 members out of a total representation of 60 members in the Board sit together to discuss resolutions passed by the Board and some of the resolutions are put down as useless while only a few are sent up with recommendations. He however felt that the Executive Committee was inclined to act arbitrarily.

Mr. Spencer Schrader explained that he himself had served in previous Board Meetings in the Executive Committee and what it normally did was to make a précis of the resolutions and forward them to the Minister but it did not sit in judgment over any resolution passed by the Board, or did not alter the substance of any resolution.

Gate Mudaliyar Wickremaratne went further to explain the work of the Board 40 or 50 years ago when it was called the Board of Agriculture and when Agricultural Instructors were appointed by the Board. In 1935 he had moved a resolution fixing a minimum price for paddy in order to encourage paddy cultivators. At the time the price paid was Rs. 1.25 a bushel. In 1941 an Executive Committee was appointed to go into this question and he as mover of that resolution was asked for his views. He had expressed his view that Rs. 2 per bushel was insufficient and asked them to fix up at least Rs. 3 per bushel. The Executive Committee was appointed but they did not do anything until during the war years a bushel went up to Rs. 15.

Senator C. A. M. de Silva: " Arer we discussing about paddy, now? "

Hon. Mr. H. W. Amarasuriya felt that if the rules laid down for the Board require an Executive Committee the Board could not act contrary to those rules, but the Executive Committee of 10 members according to the Rules was not going to preclude them from appointing special committees, and as such there was no point in protracting the debate any further.

Mr. S. Sivapalan, M.P., said that just because Government has passed certain rules it did not mean that the Board could not make a suggestion to amend any rule which was not acceptable.

The Chairman said that if the Board was not in favour of an Executive Committee it could recommend to the Minister to amend the rule which requires the appointment of an Executive Committee.

Senator C. A. M. de Silva: "With due respect to the Chair I should like to say that we should adopt the rules now and then ask for an amendment later."

Chairman: "I think you are quite correct."

At this stage Gate Mudaliyar Wickremaratne said that he has gone through the rules which constitute the Board and would like to withdraw his resolution.

Mr. Spencer Schrader felt that the Executive Committee was a part of the constitution of the Central Board of Agriculture and that it would not come in the rules adopted by the Board for the conduct of its business.

The Chairman believed that the rules produced before the members were rules of the Board and that the appointment of an Executive Committee was a requirement under the Ordinance.

Mr. Wilmot A. Perera, M.P., endorsed the views of the Chairman and said that under the circumstances the Central Board could not function without an Executive Committee.

At this stage Mr. S. C. Fernando also drew the attention of the Chairman to the fact that those rules were rules framed by the Board for the conduct of its business and did not relate to the Ordinance governing the constitution of the Board.

Hon. Mr. H. W. Amarasuriya inquired what objection the House would have if the formal procedure of the Board was followed under the constitution of the Central Board as laid down by the Minister in the Ordinance and after that to put up any recommendations and scrap whatever rule the Board did not agree to.

The Chairman agreed with this suggestion and added: "These rules were put up by the last Board for the conduct of its business. They are now before you for adoption or amendment as you wish."

Gate Mudaliyar Wickremaratne: "If I had read these rules I would not have moved this resolution."

Hon. Mr. H. W. Amarasuriya: "You can now adopt these rules for the conduct of business today and look into it later and that can be taken up at the next meeting."

Bulankulama Dissawa, M.P., said that any resolutions passed at the Board this day would be null and void unless the Board was constituted in accordance with the Ordinance.

Chairman—"My view is that as the law stands we cannot get on without an Executive Committee. Therefore I would suggest that we appoint an Executive Committee and if you do not want an Executive Committee, pass a resolution to be forwarded to the Ministry stating why you do not want an Executive Committee."

Gate Mudaliyar Kariapper—"The motion is now withdrawn and let us proceed with the business."

Finally Gate Mudaliyar Wickremaratne withdrew his resolution amending Rule 1, with the consent of the seconder, namely—"That the Board shall meet at least once in two months," and the existing rule was adopted—namely—"The meetings of the Board shall be held four times a year, or on any special occasion as may be desired in writing by not less than 15 members of the Board or by the President."

Rule 2 was taken up for discussion—namely—"Every member of the Board who has not by December 31st in each year attended at least one of the meetings held during the preceding twelve months or during his tenure of office, shall be considered to have vacated his seat, unless he has been absent through ill-health or with leave."

Senator (Col.) T. Y. Wright suggested two meetings instead of one, and inquired whether it could be put down as 50 per cent. of the meetings.

Mr. Singleton Salmon was of opinion that as Rule 2 stands, new members appointed to fill vacancies would have to be careful.

After some discussion the Chairman and the members agreed to delete the word "one" and substitute "two" and delete the words "or during his tenure of office," so that the rule may read thus:—"Every member of the Board who has not by December 31st in each year attended at least 2 of the meetings held during the preceding twelve months shall be considered to have vacated his seat, unless he has been absent through ill-health or with leave."

The Chairman suggested a further amendment to read as follows and the Board agreed to the amendment:—"Every member of the Board who has been absent for three consecutive meetings during his tenure of office without leave or if his absence was not due to ill-health shall be considered to have vacated his seat."

Rule 3 was next taken up for discussion—"At meetings of the Board, twenty members shall form the quorum."

Mr. Singleton Salmon felt that 20 members to form the quorum seemed a bit too high considering the strength of the Board.

Hon. Mr. H. W. Amarasuriya moved that 18 members shall form the quorum and Sir Wilfred de Soysa seconded. The Board agreed and the amended Rule reads as follows:—"At meetings of the Board 18 members shall form the quorum."

Rule 4 was passed without amendment, namely—"At each meeting the Chairman shall have an original vote, and in the case of an equality of votes he shall have an additional casting vote."

Rule 5 was next taken up for discussion—namely—"Thirty days at least before the date of a meeting of the Board, the Secretary shall post a notice of the meeting to each member of the Board. Notice of any subjects that a member may desire to be placed on the agenda of any meeting shall reach the Secretary ten days at least before the date appointed for the meeting."

Senator (Col.) T. Y. Wright—"It was usual to send in a précis of what a member was going to move."

Mr. Singleton Salmon felt that it was necessary for a précis of the resolutions to be moved at the meetings, to be sent along with the agenda.

Senator Justin Kotalawala—"What about the opposition; they have a chance of studying all the points against the resolutions."

Mr. Singleton Salmon stated that it was in favour of the opposition and that it was best to know about the resolutions before, rather than to think of it three days after the meeting! (*Laughter*).

Mr. Wilmot A. Perera—"We will leave it to the good sense of the mover to send in a précis about the resolutions."

The Chairman concluded that if members could send in a memorandum in addition to the resolutions, it was very desirable but he would not put it down as a rule.

Mr. Spencer Schrader said that to send a memorandum on the resolutions, to be moved at the meetings was an additional rule in one of the previous Boards brought in by Mr. A. R. T. Gibbon.

Regarding the requirement in Rule 5 that 30 days notice of a motion was necessary before the date of the meeting, the Chairman felt that it was not practicable to incorporate

any motion in the Agenda unless at least a 30 days notice was given and added that if a member had so urgent a matter to be brought up for which sufficient notice cannot be given, it could then be taken up at Ministerial level.

Rule 5 was finally adopted without amendment.

After some discussion Rules 6, 7 and 8 were adopted without amendment. They are:—

Rule 6—" The agenda of a meeting shall be posted by the Secretary to the members at least seven days before the date fixed for the meeting."

Rule 7—" It shall be the duty of the Secretary to keep a proper record of the minutes of each meeting of the Board."

Rule 8—" The meetings of the Board shall be open to the Press unless otherwise decided by the Board."

Finally Hon. Mr. H. W. Amarasuriya moved the following resolution that " At a General Meeting of the Board, Rules may be amended or new rules added with a majority of two-thirds of the members of the Board present and voting at such meeting."

The resolution was seconded by Senator (Col.) T. Y. Wright and the Board agreed to adopt it as an additional Rule.

Mr. S. Sivapalan, M.P., said that in the past a number of items and resolutions had to be postponed because many members wasted too much time on whatever they spoke of. Therefore he moved that a time limit to each speaker should be allowed at Board Meetings.

Senator (Col.) T. Y. Wright supported the resolution and seconded it.

Senator Justin Kotalawala—" In some country or other they get over this difficulty by asking the speaker to stand on one leg." (*Laughter.*)

Mr. S. Sivapalan, M.P., suggested 10 minutes for each speaker.

Hon. Mr. H. W. Amarasuriya felt that that should not come into the Rules but should be left to the discretion of the Chairman.

Mr. Singleton Salmon—" I think it unwise to limit the time because the Board meets only once in three months."

As it was intended that a time limit should not form a part of the Rules of the Board and as it was agreed to leave it to the discretion of the Chairman as suggested by Hon. Mr. H. W. Amarasuriya, Mr. Sivapalan withdrew his resolution.

V. ELECTION OF AN EXECUTIVE COMMITTEE

The following names were proposed by Hon. Mr. H. W. Amarasuriya, M.P., to form the Executive Committee of the Central Board of Agriculture:—

Dissawa A. E. Madawala
Sir Wilfred de Soysa
Senator (Col.) T. Y. Wright
Gate Mudaliyar M. S. Kariapper, M.P.
Mr. Wilmot A. Perera, M.P.
Mr. Marcus S. Rockwood
Mr. S. Sivapalan, M.P.
Gate Mudaliyar N. Wickremaratne
Mr. R. T. Chelliah
Rev. Fr. L. W. Wickremasinghe

Gate Mudaliyar Kariapper proposed the following names:—

Senator C. A. M. de Silva
Senator Justin Kotalawala

Bulankulama Dissawa, M.P., proposed the names of Mr. R. H. Spencer Schrader and Mr. R. Singleton Salmon.

The Chairman pointed out that more names than were necessary have been proposed for the Executive Committee.

At this stage Senator (Col.) T. Y. Wright withdrew and Gate Mudaliyar Wickremaratne also withdrew.

Finally the following Executive Committee was elected unanimously:—

Sir Wilfred de Soysa
Gate Mudaliyar M. S. Kariapper, M.P.
Mr. Marcus S. Rockwood
Mr. Wilmot A. Perera, M.P.
Senator Justin Kotalawala
Revd. Fr. L. W. Wickremasinghe
Mr. R. H. Spencer Schrader
Mr. R. Singleton Salmon
Mr. R. T. Chelliah
Madawala Dissawa.

VI. ELECTION OF A VICE-CHAIRMAN

Gate Mudaliyar Kariapper, M.P., proposed the name of Hon. Mr. H. W. Amarasuriya as Vice-Chairman of the Central Board of Agriculture.

T. B. Poholiyadde Dissawa, M.P., seconded

Sir James P. Obeysekera proposed the name of Mr. C. A. M. de Silva.

Senator Justin Kotalawala seconded.

Hon. Mr. H. W. Amarasuriya—" I shall be happy to offer my services if you wish, but I am not prepared to contest. I have had enough of these contests and I do not want to turn this Central Board of Agriculture also into a cockpit. I am prepared to withdraw if there is a contest.

Some discussion arose in regard to the two names proposed and some members were in favour of voting by secret ballot.

Senator (Col.) T. Y. Wright said it was awfully awkward for him to vote against anybody since both of them were his very good friends.

At this stage Hon. Mr. H. W. Amarasuriya declared he was willing to withdraw, adding—" When Gate Mudaliyar Kariapper asked me, I agreed to stand for election, but I withdraw now because another gentleman seems anxious to be Vice-Chairman."

Senator C. A. M. de Silva—" That is the wrong way to put it. I am not at all anxious although my honourable friend has been anxious."

Hon. Mr. H. W. Amarasuriya—" Not at all."

Mr. R. H. Spencer Schrader proposed the name of Sir Wilfred de Soysa as Vice-Chairman of the Central Board of Agriculture.

Sir Wilfred withdrew.

Senator Justin Kotalawala—" I respectfully submit that it is wrong to pursue with the election of a Vice-Chairman. Mr. Amarasuriya has definitely withdrawn his name and the only other name proposed is Senator C. A. M. de Silva.

Mr. P. B. Bandaranayake proposed the name of Bulankulama Dissawa, M.P.

Mr. Bulankulama Dissawa declined.

There being no other names proposed, Senator C. A. M. de Silva was declared elected Vice-Chairman of the Central Board of Agriculture.

VII. MUDALIYAR N. WICKREMARATNE MOVED THAT—

(*a*) " Provision shall be made for recording the full proceedings of the Meetings of the Board so that there shall be a record of what takes place at the meetings of the Board."

(*b*) "The present method of taking notes of the proceedings is not satisfactory and the forwarding of Motions passed by the Board to the Ministry without full discussions does not do any good to the deliberations of the Board."

The Chairman pointed out that although the Department had quite an efficient Stenographer, it was too much to expect one man to take down a whole afternoon's discussions. Normally in the Senate and Parliament two Stenographers take down at a time and they rotate every half an hour. He also explained that Stenographers who take down verbatim discussions in Parliament were of a Special Grade and that that grade of Stenographer was not assigned to Departments like ours. He also stressed that normally minutes of meetings comprised useful discussions and the decisions arrived at at meetings. If every word of the discussions were recorded the minutes would be very unweildy and would serve no useful purpose. The Chairman pointed out another difficulty that confronted a very detailed recording of the proceedings being embodied in the minutes, as Minutes of Central Board meetings had to be printed in the "Tropical Agriculturist" and the maximum number of pages allowed in that Journal was 65. The Chairman in conclusion said that if members felt that verbatim discussions should be recorded at Central Board Meetings, the Board would have to ask for provision to include more staff for Central Board work.

At this stage Sir Wilfred de Soysa, Mr. Singleton Salmon, Senator (Col.) T. Y. Wright, Mr. S. L. B. Dharmakirti, Mr. Wilmot A. Perera and a number of other members said that they were quite satisfied with the recording of minutes of previous Board Meetings and that the resolution moved by Gate Mudaliyar Wickremaratne was redundant.

Mr. S. C. Fernando, Registrar of Co-operative Societies, endorsing the views of the members that the minutes as reported at previous Board Meetings was quite satisfactory explained that when he was Secretary of the Central Board at one time, only a précis of the proceedings was prepared by the Stenographer and that it was always open to the members to amplify the proceedings if they so desired, and all the members were quite satisfied with the minutes.

Hon. Mr. H. W. Amarasuriya requested the mover not to take up the resolution at this stage and Gate Mudaliyar Wickremaratne withdrew his resolution in view of the difficulties expressed by the Chairman in this respect.

VIII. TABLE LETTER FROM THE SECRETARY, CEYLON COCONUT BOARD, REGARDING RELIEF AND REHABILITATION OF THE COCONUT INDUSTRY

Letter No. F/36 dated 20th May, 1948, from the Liaison Officer and Special Secretary of the Ceylon Coconut Board, addressed to the President, Central Board of Agriculture, was tabled. The Coconut Board had invited suggestions or representations from the Central Board in terms of the following sections of the Coconut Products Ordinance of Agriculture—(Cap. 129)—for the relief and rehabilitation of the Coconut Industry in Ceylon:—

Sec. 3 (7) : to investigate questions relating to freights and the export or transport of coconut products and to make recommendations thereon to the Minister.

Sec. 3 (8) : to formulate for the consideration of the Minister schemes for the establishment, supervision, control and financial support of such institutions as may be or become necessary for the amelioration of the conditions of the coconut industry.

Sec. 3 (12) : to formulate schemes to give effect to the subjects and purposes of this Ordinance.

Mr. Clement Dias said that the coconut industry is experiencing a 50 per cent. shortage in the crop and although the price offered seem to be big prices, production has gone down by 50 per cent., and as a result the money coming in is very little. He felt that the duties should be reduced so that Planters and Proprietors may get a better income from coconut. He added that 75 per cent. of the coconut estates in Ceylon were owned by peasants and only 25 per cent. were owned by big proprietors so that if duties were reduced 75 per cent. of the income from coconut would go to the peasant.

Senator C. A. M. de Silva commenting on the subject said that in Ceylon the producer gets only Rs. 150 for a candy of copra while the State makes about Rs. 175 or Rs. 180 per candy. He added: "If I am right, nowhere in the World does a Government tax the producer so much. In Ceylon with various Government projects they have taxed the producer to the tune of even more than a hundred per cent. I think the better idea would be a long-term contract with the British Government. This is the time for us to negotiate a long-term contract. When my honourable friend the past Minister for Commerce was there and when I was Chairman of the Low Country Products Association, I suggested we should enter into a long-term contract even at a lesser price so that the Coconut Industry might automatically be rehabilitated. We have been promised by Sir Oliver at one stage that he would give us out of the export duty of Rs. 25, seedlings free, but, Sir, the Replanting Officer of the Research Institute has raised the value of seedlings from 35 cents to 75 cents." He, however, stressed the fact that seedlings was a minor detail and the most important factor was a reduction in the export duty. Besides these there were several other problems that confronted the replanting scheme such as barbed wire, manure, &c. He emphasised that immediately the price of coconut went up, the price of manure had gone up by 300 per cent. In the circumstances he doubted whether the Coconut Industry would survive or fail as in the case of rubber.

Mr. Marcus S. Rockwood suggested that the Board should recommend the introduction of legislation to supervise wayside dealers and other people who buy copra and emphasised that there were a number of thefts in coconut and some protection should be provided as in the case of tea and rubber.

Gate Mudaliyar Wickremaratne said that in the case of Tea and Rubber there were recognized dealers whereas in the case of coconut every garden had it and unless those who owned estates marked their seeds nothing could be done.

Senator (Col.) T. Y. Wright said that as all the other industries were protected coconut should also be protected. He inquired whether it was not feasible to appoint a Special Committee to go into the needs of small holders. Regarding proprietors of coconut estates, he did not know exactly what profits they were making, but he was aware that some coconut estates were making enormous profits. He recalled an instance when the price of tea went down to 25 cents, but they could not get anything at all from Government.

He concluded by stating—"I think the small holders should have some assistance, but I am not sure of proprietors of big estates; they are making pretty good profits."

Sir James P. Obeysekera said that 30 per cent. of the seedlings are destroyed by white-ants and emphasised the need for preventing this wastage. He also stressed the need for the supply of Ammonium Sulphate and the need for reducing the duty on tractors, &c.

Senator (Col.) T. Y. Wright said that Senator Justin Kotalawala was very interested in composting and inquired whether Government could not do anything about it.

Mr. Wilmot A. Perera inquired whether the seedlings distributed carry any guarantee of purity.

The Chairman replied that it is not possible to have purity in coconut.

Mr. Marcus S. Rockwood described the method of selecting mother palms at the Coconut Research Scheme. A number of trees are recorded for three years and every two months after the nuts are picked they are left under the tree. After every picking the nuts are weighed and the best bearers are marked and those trees producing over a hundred nuts of a reasonable weight are marked as mother palms. He said that there were two grades of nuts selected and the first grade has been carried on for the last 7 years.

The Chairman said that Co-operative Sales Societies have been requested to put down nurseries and it is probable that they will be able to distribute seedlings at 35 cents. But in the case of seedlings produced by the Research Scheme, they are carefully selected out of mother palms in the seedlings stage in the nursery and usually always 40 to 50 per cent. of the nuts in the nursery are discarded. In the Coconut Research Scheme what they do now is nursery selection rather than from mother palms selection. In the nursery seedlings are very rigidly and strictly selected. He said that that is the best that can be done at the present time since strict selection out of mother palms has been relaxed owing to the need for more seedlings. He was not yet sure that the progeny of high-yielding mother palms would also give high yields. He also mentioned that an experimental coconut plot has been opened at Walpita to test that experimentally but the results would not be available for some years. He emphasised that he was very much opposed to the free distribution of seedlings because when seedlings were distributed free only a very small percentage are put to good use while an enormous amount went to waste. If men were made to pay even 5 to 10 cents for a seedling, some interest would be taken to see it planted.

Senator Justin Kotalawala commenting on the proposal made by Senator C. A. M. de Silva that since the Government is making so much money out of the coconut industry relief should be given in the form of a 25 rupees reduction in the export duty, emphasised that the better idea would be to make use of this money in rehabilitating the industry on a long-term policy and would be in the best interests of Ceylon. He also added that composting should be encouraged and that new ways of improving the soil by disc harrowing, &c., should be introduced. He suggested that a special sub-committee be appointed to go into this question of Rehabilitating the Coconut Industry.

In the meantime the Board decided that an interim reply should be sent to the Liaison Officer and Special Secretary of the Ceylon Coconut Board.

Mr. Wilmot A. Perera inquired whether members had already expressed their views before the Committee.

Mr. Marcus S. Rockwood said that he had taken part in the discussions of the Coconut Board which was held in Puttalam and emphasised that the Coconut Board had really gone thoroughly into the matter. The money set apart for this purpose has nothing to do with the activities of the Coconut Board. He said that they as members of the Board should consider it a part of their duty in the interests of Ceylon to advise what Government should do to help the industry. He added that according to Dr. Child Government has earned 31 million rupees last year out of the Coconut Industry.

At this stage the Chairman drew the attention of the Board to the appointment of a sub-Committee to frame a reply to the letter of the Coconut Board.

Hon. Mr. H. W. Amarasuriya pointed out that the Coconut Board comes within the Ministry of Commerce and Trade whereas the Central Board is under the Ministry of Agriculture.

The Chairman replied that that need not prevent the Central Board from taking action on this letter and added that the Commission appointed is collecting some statistics in India, at the moment and after they return they would be publishing their report in final

form and before the final report is out the Central Board would have to submit its report so that it has to be done expeditiously, and stressed the importance of this matter.

Hon. Mr. Amarasuriya said that he was not opposed to the Central Board making any recommendations to the Coconut Commission, but what he wanted to stress was that the Central Board should make recommendations and submit the report as quickly as possible.

Mudaliyar Abulcassim Marakar—" In view of the Hon. Minister's suggestion to expedite sending in our report to the Coconut Commission, I would suggest that before we submit our proposals and before we form the Committee, they might send in their publication. We should not delay in sending our proposal even today. In particular those interested in the advancement of the Coconut Industry must, I believe, take this opportunity of submitting their views today. I am really interested in the improvement of this industry, not only this industry but paddy plantation as well. The Commission was appointed to go round Ceylon and collect all available evidence and advise ways and means of rehabilitating the industry. Unfortunately on their tour, when they went to Jaffna, after visiting one or two places in the Peninsula, the Stenographer of the Commission got drowned in a lake and their visits to Mannar and other places were postponed. I do not think their report will be complete without visiting important places like Mannar and Jaffna. In Jaffna there are places where the Commission will be able to collect sufficient evidence because there are palmyrah and coconut palms." Mudaliyar Abulcassim Marakar submitted the following proposals for submission to the Commission:—

(1) In the interests of small-holders, Government should open up centres to purchase copra in the important copra-producing areas.

He added that Government has already opened up centres in certain areas but more centres should be opened up immediately to purchase the produce at a guaranteed price.

(2) He emphasised that he foresaw a decline in the Coconut Industry and therefore replanting should be attended to immediately, otherwise in a few decades we would not be able to see any coconut palms in the Island. Therefore he suggested that necessary facilities be afforded to planters and estate owners to see that the land is replanted with coconut palms.

(3) Provision should be made for the formation of nurseries to provide the necessary seedlings.

Mudaliyar Abulcassim Marakar added: " I remember to have come across in the Estimates provision made in a sum of Rs. 5,000 for the formation of nurseries and issue of seedlings. I feel that this amount is rather inadequate."

At this stage the Chairman corrected Mudaliyar Marakar and said it was not Rs. 5,000 but over 1 lakh 70 thousand rupees have been provided for under the Coconut Replanting Scheme.

Mudaliyar Abulcassim Marakar continued: " That is a splendid idea. There is another matter in general. I do not know in the north, but particularly in the area where I come from, we have not been manure-minded at all. We have taken care of our paddy fields but we have neglected our coconut palms. I suggest to see that the coconut palms or coconut estates are manured carefully and that provision be made for supplying the necessary manure." He added that although for asweddumizing paddy lands Government has subsidised at the rate of Rs. 100 per acre, he felt rather nervous to suggest a subsidy for this industry. At the same time he felt that if a small subsidy were given to small holders it would help to increase the productivity of coconut estates and to open up new plantations. He concluded that those were all his suggestions and that he had put them before the Board for its consideration before submission to the Commission.

The Chairman once again drew the attention of the Board to the fact that if the recommendations of the Board were to reach the Coconut Commission in time the Board would have to go fairly quickly with it and inquired whether the members favoured the appointment of a sub-Committee to go into the matter.

Hon. Mr. H. W. Amarasuriya suggested that a sub-Committee should be appointed with specific directions to go into the matter and submit a draft report to be forwarded to the Coconut Commission and that the Chairman should instruct the Executive Committee to see that the matter is expedited.

Mr. W. M. Cumaraswamy suggested that the sub-Committee should consist of representatives from the Dry Zone as well, who would have a knowledge of the conditions of the Dry Zone, manuring, &c.

The House agreed with this suggestion and the following members were co-opted to the Executive Committee which will convene a meeting for submitting a suitable reply to the Coconut Board, embodying proposals from the Central Board of Agriculture: Messrs. W. M. Cumaraswamy, A. Hensman and Mudaliyar Abulcassim Marakar.

Mr. S. L. B. Dharmakirti seconded Hon. Mr. Amarasuriya's proposal.

Senator C. Wijesinghe said that it has been emphasised on the floor of that House by most of the members that the Coconut Industry has contributed about 31 million rupees to revenue and it should be reverted back to the industry. He emphasised that if that principle were accepted by Government, the Government would fall into serious difficulty. He said that 1,300,000 acres have contributed this amount whereas in the case of tea half that acreage has contributed double that revenue to Government.

Gate Mudaliyar N. Wickremaratne proposed that a special meeting of the Board should be held for discussing food production.

Mr. R. H. Spencer Schrader seconded.

The Chairman endorsed the view that a special meeting should be summoned for discussing food production and the House agreed.

Mr. Marcus S. Rockwood suggested the 16th of May or the 20th of May for holding this special meeting on food production. He also drew the attention of the Board to the All Ceylon Paddy Exhibition organised by the Low Country Products Association under the very able management of Mr. Clement Dias and wished it every success and hoped that members of the Board who represent various District Agricultural Committees would take an interest.

Mr. Clement Dias said that already 24,000 phamplets had been distributed and that he expected a good response. He said that the question had arisen as to why the Exhibition should be held in Colombo and not in a central paddy-producing area. He explained that Colombo was a convienent place to meet from all parts of the Island. He stressed that if paddy cultivators in the Island took an interest there were possbilities of getting double the yields received at present.

In conclusion the Chairman thanked all the members of the Board for their presence and the useful suggestions made and said he would endeavour to call a special meeting to discuss food production as early as possible.

Gate Mudaliyar Kariapper proposed a vote of thanks to the Chair.

The meeting terminated at 5.15 p.m.

H. E. S. RANASINGHE,
Secretary, Central Board of Agriculture.

Peradeniya, April 23, 1949.

Rubber Research Scheme (Ceylon)

MINUTES OF THE NINETY-SECOND MEETING OF THE RUBBER RESEARCH BOARD HELD AT THE PLANTERS' ASSOCIATION HEADQUARTERS, COLOMBO, AT 2.30 P.M., ON MONDAY, MAY 23, 1949

Present.—Mr. D. Rhind, O.B.E. (Director of Agriculture) in the chair; Dr. E. Rhodes (Director, R. R. S.); Mr. T. D. Perera, C.C.S. (Deputy Secretary to the Treasury); Mr. H. St. J. Cole Bowen; Major Montague Jayewickrema, M.P.; Mr. R. C. L. Notley and Mr. J. L. D. Peiris.

Apologies for absence were received from Messrs. Francis Amarasuriya and F. A. Obeyesekera.

1. MINUTES

Draft minutes of the meeting held on March 28, 1949, which had been circulated to members, were signed by the Chairman on signification of members' assent that they were in order.

2. BOARD

(*a*) *Changes in membership.*—The Chairman reported that Senator U. A. Jayasundera, K.C., had resigned on April 16. A nomination to fill the vacancy had not yet been made.

(*b*) *Quorum for meetings.*—As the constitution of the Board had been reduced from seventeen to ten members the Chairman enquired whether the quorum for meetings should be reduced. It was agreed that the quorum should remain unchanged.

3. EXPERIMENTAL COMMITTEE

It was agreed that a permanent Committee should be appointed to deal with experimental and minor estate matters and the Director was asked to make enquiries regarding the constitution of the Experimental Committee of the Tea Research Board.

4. STAFF

(*a*) *Director.*—Reported that Dr. E. Phillis had accepted the appointment on the terms offered and that he was expected to arrive in Ceylon on June 22.

(*b*) *Oidium Research Officer.*—Reported that Dr. H. E. Young had accepted the appointment on the terms offered and that he was expected to arrive in Ceylon about the middle of July, 1949.

Major Jayewickrema came into the meeting at this stage.

(*c*) *Chemist.*—Reported that eight applications had been received and that a summary of the applications had been circulated to members. The applications were considered and it was agreed that the post be offered to Mr. M. W. Philpott, M.Sc. (Lond.), F.R.I.C.

Major Jayewickreme left the meeting.

5. REPORTS AND ACCOUNTS

(*a*) *Report of the work of the Rubber Research Board, 1948*—was approved.

(*b*) *Director's report for the 1st Quarter, 1949*—was approved.

(*c*) *Visiting Agent's report of April 14, 1949*—was approved.

It was noted that the crop realized at Nivitigalakele in 1948 had exceeded the previous year's crop by 10,606 lb. and that the cost of production was 39·88 cts. per lb.

(*d*) *Estate accounts for December, 1948, and January, 1949*—were tabled.

6. LONDON ADVISORY COMMITTEE

(*a*) *Annual Report for 1948*—was approved.

(*b*) *Minutes of meetings of the Committee and the Technical Sub-Committee held on November 5, 1948*—were tabled.

7. PUBLICATIONS

The following publications were tabled :—

(*a*) Supplement to Annual Report for 1947, (*b*) Second Supplement to Advisory Circular No. 17 (Revised, March, 1949).

Before the meeting terminated reference was made to the valuable services rendered by Dr. Rhodes as Director and it was decided to place on record the Board's appreciation of his services.

Dartonfield,
Agalawatta, June 15, 1949.

C. D. DE FONSEKA,
Secretary-Accountant.

ANIMAL DISEASE RETURN FOR THE MONTH ENDED APRIL 30, 1949

Province	Disease	Fresh cases during the month	Cases up to date since Jan. 1, 1949	From Jan. 1, 1949, to April 30, 1949			
				Deaths	Recoveries	Balance ill	No. shot
Western Province	Foot-and-mouth	3	205	2	199	4	—
Colombo Municipality	Foot-and-mouth	22	102	—	102	—	—
	Babies	7	22	22	—	—	—
Cattle Quarantine Station	Anthrax in sheep and goats	11	63	63	—	—	—
Northern Province	Anthrax	—	3	3	—	—	—
	Foot-and-mouth	78	174	3	73	98	—
	Babies	1	1	—	—	—	—
North-Western Province	Foot-and-mouth	118	4,022	319	3,455	248	—
North-Central Province	Foot-and-mouth	—	1,856	—	1,856	—	—
Sabaragamuwa Province	Piroplasmosis	—	10	3	7	—	—
Southern Province	Babies	3	7	—	—	—	7
Central Province	Foot-and-mouth	55	413	—	398	43	—
	Babies	—	8	8	—	—	—
Uva Province	Babies	1	1	1	—	—	—

Peradeniya, June 22, 1949

P. G. MALKANI,
Acting Deputy Director (Animal Husbandry),
and Government Veterinary Surgeon.

ANIMAL DISEASE RETURN FOR THE MONTH ENDED MAY 31, 1949

Province	Disease	Total cases during the month	Cases up to date since Jan. 1, 1949	From July 1, 1948 to May 31, 1949			
				Deaths	Recoveries	Balance ill	Slaughter
Western Province ..	Foot-and-mouth	24	226	1	224	1	—
Colombo Municipality	Foot-and-mouth	60	162	—	102	60	—
	Rabies	5	27	27	—	—	—
Cattle Quarantine Station	Anthrax in (sheep and goats)	6	69	69	—	—	—
Northern Province	Anthrax	—	3	3	—	—	—
	Foot-and-mouth	409	583	21	225	337	—
	Rabies	1	1	1	—	—	—
North-Western Province ..	Foot-and-mouth	427	4,449	221	4,078	50	—
North-Central Province ..	Foot-and-mouth	89	1,936	—	1,856	80	—
Central Province	Foot-and-mouth	—	412	—	412	—	—
	Rabies	—	8	8	—	—	—
Sabaragamuwa Province ..	Piroplasmosis	—	10	3	7	—	—
Southern Province ..	Rabies	1	8	1	—	—	7
Uva Province ..	Rabies	—	1	1	—	—	—

P. G. MALKANI,
Acting Deputy Director (Animal Husbandry) and Government Veterinary Surgeon.

Peradeniya July 25, 1949.

4——J. N. A 92215 (10/49)

ANIMAL DISEASE RETURN FOR THE MONTH ENDED JUNE 30, 1949

Province	Disease	Fresh Cases during the month	Cases up to date since Jan. 1, 1949	From Jan. 1, 1949, to June 30, 1949			
				Deaths	Recoveries	Balance Ill	No. Shot
Western Province	Foot-and-mouth	90	319	7	271	41	—
	Rabies	1	1	1	—	—	—
Colombo Municipality	Foot-and-mouth	135	297	—	162	135	—
	Rabies	8	35	35	—	—	—
Cattle Quarantine Station	Anthrax (in sheep and goats)	—	69	69	—	—	—
	Foot-and-mouth	12	12	—	12	—	—
Northern Province	Anthrax	192	195	188	7	—	—
	Foot-and-mouth	208	791	21	617	153	—
	Rabies	—	1	1	—	—	—
	Black Quarter	17	17	17	—	—	—
North-Central Province	Foot-and-mouth	179	2,115	2	1,936	177	—
North-Western Province	Foot-and-mouth	223	4,672	321	4,228	123	—
Central Province	Foot-and-mouth	20	439	—	425	14	—
	Piroplasmosis	1	1	—	1	—	—
	Rabies	—	8	8	—	—	—
Sabaragamuwa Province	Piroplasmosis	—	10	3	7	—	—
	Rabies	1	1	—	—	—	1
Southern Province	Rabies	—	8	1	—	—	7
Uva Province	Rabies	1	1	1	—	—	—

P. G. MALKANI,
Acting Deputy Director (Animal Husbandry)
and Government Veterinary Surgeon.

Peradeniya, September 26, 1949.

METEOROLOGICAL REPORT, APRIL, 1949

STATION	TEMPERATURE				HUMIDITY		Amount of Cloud	RAINFALL		
	Mean Maximum	Offset	Mean Minimum	Offset	Day	Night (from Minimum)		Amount	No. of Rainy Days	Offset
	°	°	°	°	%	%		In.		In.
Agalawatta	88·8	—0·2	71·9	—1·6	87	98	4·4	19·58	18	+ 5·60
Anuradhapura	91·4	—0·1	74·4	—0·1	71	93	4·6	6·39	12	— 0·04
Badulla	84·8	+0·7	66·0	—0·2	74	95	4·6	7·22	15	+ 0·22
Batticaloa	89·2	+1·4	76·5	—0·2	76	88	4·8	3·30	12	+ 1·00
Colombo	87·2	—0·7	74·7	—1·2	78	93	4·8	22·98	14	+13·91
Diyatalawa	77·9	+0·2	61·1	+0·6	74	89	4·7	10·65	21	+ 4·11
Galle	85·1	—1·1	75·8	—1·0	80	88	5·1	12·06	14	+ 3·35
Hakgala ..	—	—	—	—	—	—	—	—	—	—
Hambantota	87·0	—0·8	76·0	—0·3	78	91	4·5	4·80	9	+ 0·94
Jaffna	89·8	+0·3	81·2	+1·1	75	83	3·6	1·69	6	— 0·54
Kandy	88·1	—0·2	69·8	—0·2	64	90	3·4	6·89	14	+ 0·40
Kurunegala	90·9	—0·2	74·4	—0·3	70	88	4·4	6·75	15	— 3·16
Lunuwila	88·9	+0·3	75·2	—0·4	75	93	4·2	17·93	12	+11·09
Mannar	89·9	—0·4	77.6	—0·4	76	86	4·6	1·62	5	— 1·80
Nuwara Eliya	70 8	0·5	50·3	+0·5	78	93	5·2	6·30	19	+ 1·32
Puttalam	88·3	—1·0	75·6	—0·6	77	91	4·8	3·30	11	— 1·58
Ratnapura	90 9	—0·2	72·9	—0·9	75	93	5·4	10·74	18	— 0·83
Talawakele	77·1	—0·5	57·4	—0·5	76	85	5·2	8·04	18	+ 1·74
Trincomalee	89·6	+0·4	77·0	—0·6	74	86	4·2	4·79	6	+ 2·66

The main feature of the weather in April was the unprecedentedly heavy rains that were experienced along the south-western coastal regions, chiefly from Colombo to Negombo, during the easter week. Heaviest rain occurred from the 14th to 17th at Colombo and in areas just north of it. During these four days the gauge at Elie House Reservoir (Mutwal) recorded a total of 28·88 inches which was more than three times the April average. Similarly, 26·62 inches at Maligakanda and 23·96 inches at Colombo Fort were nearly three times their respective April averages. Other stations which recorded over 20 inches during this period were Waragoda (St. Joseph's College Farm), Hunupitiya and Ja-ela (Alexandra Estate). Of the four days the day with the heaviest rain was the 17th (Easter Sunday) when most of these stations received over 10 inches, the highest being 12·01 inches at Hunupitiya, 11·73 inches at Colombo Fort and 11·52 inches at Orange Hill Estate, Ragama. An analysis of the pluviograph record of the rainstorm in the Colombo Fort area on the afternoon of the 17th shows it to be possibly the most intense shower ever experienced in Ceylon, a total of 10·00 inches being registered in just over 3 hours.

On account of the heavy precipitation during this period the monthly totals at these stations were abnormally high, and constituted records for April. Thus, 35·39 inches at Elie House is the highest total in 30 years (the previous highest being only 20·57 inches in 1925), and 33·78 inches at Maligakanda the highest in 56 years (previous highest 24·12 inches in 1898). At Colombo Fort where observations are available for 80 years, 29·32 inches received this year beat the previous record of 28·78 inches created in 1888. Another station which recorded over 30 inches was St. Joseph's Cattle Farm Waragoda (34·95 inches).

There was also fairly heavy rain on the south-western foot-hills where a few stations recorded over 20 inches for the month, the largest totals being 33·11 inches at Carney Estate and 30·23 inches at Kitulgala. Rainfall decreased towards the north and east, the area to the north of Mannar and some parts of Batticaloa District receiving less than two inches for the month.

During April, the railfall was irregularly distributed on either side of average, the excesses predominating. The largest excesses were found along the south-west coast, where the total at Elie House was as much as 25·99 inches above average. Those at Maligakanda and Colombo Fort were above normal by 24·74 and 20·78 inches respectively. In other parts of the Island the excesses were much smaller, being mostly below 5 inches. Deficits were found in the north, and in limited areas elsewhere, the largest being 7·02 inches at Hiniduma, 5.40 inches at Hanwella and 5.19 inches at Alagalla.

There were 42 daily falls over 5 inches, nearly all of them occurring during the period, 14th-17th ,the highest being 12·01 inches at Hunupitiya on the 17th.

Weather after the 20th was generally dry.

Temperatures were on the whole slightly below average. The highest recorded shade temperature, was 96·7° at Trincomalee on the 24th, while the lowest temperature was 41·9° at Nuwara Eliya on the 29th. Day humidity was above normal and night humidity slightly below. Wind direction was variable.

D. T. E. DASSANAYAKE,
Superintendent, Observatory.

METEOROLOGICAL REPORT, MAY, 1949

STATION	TEMPERATURE				HUMIDITY		Amount of Cloud	RAINFALL		
	Mean Maximum	Offset	Mean Minimum	Offset	Day	Night (from Minimum)		Amount	No. of Rainy Days	Offset
	°	°	°	°	%	%		In.		In.
Agalawatta	87·5	+0·6	73·7	—0·8	83	98	6·6	18·73	18	— 8·15
Anuradhapura	90·6	0	75·9	—0·3	74	93	5·4	3·22	12	— 0·32
Badulla	86·7	+1·4	66·2	—0·2	69	95	5·0	0·51	6	— 4·18
Batticaloa	89·4	—0·8	77·6	—0·2	74	86	3·8	1·82	7	+ 0·03
Colombo	87·0	0	76·8	—0·7	79	91	6·0	12·62	20	— 2·87
Diyatalawa	78·6	0	62·1	0	70	86	5·3	2·25	14	— 3·81
Galle	85·4	+0·5	79·0	+1·0	79	84	5·9	3·50	13	— 9·17
Hakgala	—	—	—	—	—	—	—	3·10	12	— 5·35
Hambantota	87·0	+0·3	77·9	+0·5	76	91	4·2	5·29	13	+ 1·02
Jaffna	87·8	—0·3	81·5	—0·1	78	83	4·4	3·63	6	+ 1·63
Kandy	86·3	—0·8	70·5	—0·6	68	90	5·5	7·24	21	— 0·33
Kurunegala	88·9	—0·3	75·4	—0·6	72	86	5·2	10·10	21	+ 2·55
Lunuwila	86·9	—0·6	76·4	—0·7	82	93	5·9	20·86	21	+ 8·93
Mannar	88·8	—0·7	80·4	—0·2	78	82	5·2	4·93	7	+ 3·14
Nuwara Eliya	69·8	—0·7	52·6	—0·6	76	91	5·8	5·01	17	— 3·46
Puttalam	88·3	+0·1	78·3	—0·5	78	89	6·2	4·56	12	+ 0·79
Ratnapura	90·0	+1·2	74·3	—0·5	76	93	6·1	22·52	19	+ 1·61
Talawakele	74·8	—0·7	58·8	—1·0	76	85	5·3	7·06	22	— 2·35
Trincomalee	91·8	—0·1	78·0	—0·8	72	84	4·6	3·82	6	+ 0·59

Rainfall in May was above normal in the north and north-west of the Island, and in the south-western foot-hills, and below normal elsewhere. The larger excesses (of the order of 5 to 10 inches) occurred in the southern parts of North-Western Province, the highest being 9·23 inches at Kankaniyamulla, 8·93 inches at Lunuwila and 8·45 inches at Gokarella. The largest excess was, however, 9·98 inches at Kellie Estate on the south-western slopes of the hills. The larger deficits (also of the order of 5 to 10 inches) were found in the south-western low-country, the rainfall at Hiniduma being 12·28 inches below average, and at Galagoda Estate and Hiyare, 11·96 and 10·86 inches below their respective averages.

Rainfall was heaviest on the south-western foot-hills and the adjacent mid-country, where several stations recorded totals over 25 inches, the highest being 34·24 inches at Dabar Estate, 33·03 inches at Watawala, 32·40 inches at Maliboda Estate and 31·98 inches at Kellie Estate.

Comparatively heavy rain also occurred in the southern parts of North-Western Province, a number of stations recording totals over 15 inches. Least rain was experienced on the eastern slopes of the central hills where the monthly totals were generally below an inch.

There were 30 daily falls of five inches or over in May, nearly all of them occurring on the 12th or the 20th. The largest was 7·40 inches on the 12th both at Hallayen Estate and Sunderland Estate.

Temperatures were generally below average. The highest recorded shade temperature was 97·0° at Trincomalee on the 12th, while the lowest temperature was 42·8° at Nuwara Eliya on the 4th. Humidities were, on the whole, about normal. Winds were south-westerly.

D. T. E. DASSANAYAKE,
Superintendent, Observatory.

METEOROLOGICAL REPORT, JUNE, 1949

STATION	TEMPERATURE				HUMIDITY		Amount of Cloud	RAINFALL		
	Mean Maximum	Offset	Mean Minimum	Offset	Day	Night (from Minimum)		Amount	No. of Rainy Days	Offset
	°	°	°	°	%	%		In.		In.
Agalawatta	86·0	+0·8	73·3	—0·8	86	98	7·5	16·36	25	— 1·10
Anuradhapura	90·3	+0·5	76·4	0	70	91	6·2	0·04	3	— 0·69
Badulla	86·2	+0·8	65·6	+0·2	70	95	6·6	1·12	5	— 0·42
Batticaloa	92·2	—0·1	78·0	+0·3	64	80	7·0	1·19	4	+ 0·30
Colombo	85·3	—0·1	76·8	—0·5	80	86	6·7	12·46	25	+ 3·80
Diyatalawa	77·5	—0·1	62·9	—0·3	66	81	6·9	1·75	6	— 0·21
Galle	83·7	0	78·1	+0·8	82	84	6·8	7·66	24	— 0·78
Hakgala	67·7	—0·8	58·4	+0·1	86	89	6·8	4·15	13	— 2·46
Hambantota	86·0	—0·4	77·0	+0·2	81	88	6·8	3.38	13	+ 1·27
Jaffna	86·9	+0·3	81·3	+0·4	78	83	5·6	0	0	— 0·39
Kandy	82·4	—1·0	70·8	—0·5	80	87	7·2	7·74	22	— 1·09
Kurunegala	85·8	—0·8	75·2	—0·4	76	86	6·2	7·80	22	+ 1·01
Lunuwila	84·8	—0·8	76·4	—0·7	84	91	6·6	11·47	25	+ 3·81
Mannar	87·5	—0·8	80·6	0	76	82	6·5	0·01	1	— 0·35
Nuwara Eliya	65·3	—0·4	55·8	+0·2	84	88	7·3	8·01	23	— 2·42
Puttalam	86·0	—0·3	79·4	+0·2	78	82	6·6	0·62	5	— 0·78
Ratnapura	86·6	—0·1	74·3	—0·4	83	93	7·2	18·43	27	— 0·12
Talawakele	70·0	—0·9	60·1	—0·3	84	89	7·1	11·38	23	— 1·90
Trincomalee	92·4	+0·2	79·1	+0·1	64	80	6·5	0	0	— 0·93

Typical south-west monsoon weather prevailed over the Island in June. The rainfall was almost entirely confined to the south-western parts, the windward slopes of the hills experiencing rain nearly every day. Several stations recorded monthly totals over 25 inches, the highest being 38·85 inches at Kellie Estate, 38·51 inches at Theydon Bois Group, 37·02 inches at Padupola and 36·04 inches at Norton Bridge. In the south-western coastal areas the monthly totals were of the order of 10 inches. Here, too, the rainfall was well distributed through the month. From the region of heavy rain, the rainfall decreased, gradually towards the north, but more rapidly to the leeward of the hills, monthly totals outside the south-west quarter being generally below 2 inches. Practically no rain was experienced in the Northern and North-Central Provinces and in the Trincomalee District.

The rainfall was below normal over a large portion of the Island, but the deficits were generally small, the only appreciable shortfalls being 8·57 inches at Hapugastenne Group, 6·31 inches at Opata and 4·96 inches at Yakkatuwa. The excesses which were also generally small were found chiefly in the western parts and in the south-east, the highest being 11·69 inches at Kellie Estate, 9·75 inches at Digalla Estate and 7·15 inches at Labugama.

Although there were comparatively large monthly totals, outstanding daily falls were rare, the only one recorded over 5 inches being 6·00 inches at Theydon Bois Group on the 19th.

Temperatures were, on the whole, below normal by day and about normal by night. The highest shade temperature for the month was 96·0° at Batticaloa, recorded on two consecutive days, the 25th and 26th, while the lowest temperature was 51·6° at Nuwara Eliya on the 2nd. Humidities were above average by day and about average by night, while the cloud amounts were above average. The prevailing wind direction was south-westerly.

D T. E DASSANAYAKE,
Superintendent, Observatory.

5——J. N. A 92215 (10/49)